

Conservation and Management Advice

SOLWAY FIRTH SPA

UK SITE: 9005012

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This document provides advice to Public Authorities and stakeholders about the activities that may affect the protected features of the Solway Firth Special Protection Area (SPA). It provides advice from Scottish Natural Heritage (SNH) (operating under the name of and hereinafter referred to as NatureScot) and Natural England respectively, under Regulation 33(2) of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland) and Regulation 37(3) of The Conservation of Habitats and Species Regulations 2017 (the "2017 Regulations"), to other relevant authorities on the Conservation Objectives for the Solway Firth SPA. It also provides advice on activities/operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the site has been designated. It covers a range of activities and developments but is not exhaustive. It focuses on where there is a risk to achieving the Conservation Objectives. The paper does not attempt to cover all possible future activities or eventualities (e.g. as a result of accidents), and does not consider cumulative effects.

Further information on marine protected areas and management is available at -

<https://www.gov.scot/policies/marine-environment/marine-protected-areas/>

For the full range of MPA site documents and more on the fascinating range of marine life to be found in Scotland's seas, please visit -

www.nature.scot/mpas or <https://jncc.gov.uk/advice/marine-protected-areas/>

and for English seas, please visit –

<https://storymaps.arcgis.com/stories/65761fff9b6845e482fe43e96e3e9d58> or
<https://www.gov.uk/government/collections/conservation-advice-packages-for-marine-protected-areas>

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Contents

1. OVERVIEW OF DOCUMENT	5
2. INTRODUCTION	5
2.1 Purpose statement.....	5
2.2 Conservation benefits	5
2.3 Wider benefits	6
2.4 Contribution to policy commitments.....	8
3. ROLES	8
4. PROTECTED FEATURES AND STATUS	9
5. SETTING CONSERVATION OBJECTIVES	12
5.1 Background	12
5.2 Relationship between feature condition and Conservation Objectives.....	12
5.3 Conservation priorities	14
5.4 Overlapping Marine Protected Areas	14
6 FEATURE SENSITIVITY	14
6.1 Red-throated diver (non-breeding)	15
6.2 Whooper swan (non-breeding)	15
6.3 Barnacle goose (non-breeding)	15
6.4 Eurasian golden plover (non-breeding)	15
6.5 Bar-tailed godwit (non-breeding).....	15
6.6 Pink-footed goose (non-breeding).....	16
6.7 Common shelduck (non-breeding).....	16
6.8 Common teal (non-breeding)	16
6.9 Northern pintail (non-breeding)	16
6.10 Northern shoveler (non-breeding)	16
6.11 Greater scaup (non-breeding).....	16
6.12 Common scoter (non-breeding).....	17
6.13 Common goldeneye (non-breeding).....	17
6.14 Goosander (non-breeding).....	17
6.15 Eurasian oystercatcher (non-breeding)	17
6.16 Red knot (non-breeding)	17
6.17 Ringed plover (non-breeding).....	18
6.18 Grey plover (non-breeding).....	18
6.19 Northern lapwing (non-breeding)	18
6.20 Dunlin (non-breeding).....	18
6.21 Sanderling (non-breeding)	18

6.22	Common redshank (non-breeding).....	18
6.23	Ruddy turnstone (non-breeding)	19
6.24	Eurasian curlew (non-breeding)	19
6.25	Great cormorant (non-breeding).....	19
6.26	Black-headed gull (non-breeding)	19
6.27	Common gull (non-breeding).....	19
6.28	Herring gull (non-breeding).....	20
7	MANAGEMENT	20
7.1	Conservation Measures.....	20
7.2	Advice to support management.....	21
7.3	Best Practice	22
8	RESEARCH AND SURVEY REQUIREMENTS	40
	ANNEX 1. SOLWAY FIRTH SPA CONSERVATION OBJECTIVES	42
	ANNEX 2: SUPPORTING INFORMATION	99
	Factors determining the potential for feature recovery	99
	ANNEX 3: GLOSSARY FOR CONSERVATION OBJECTIVES AND REFERENCES	112
	Glossary.....	112
	References.....	113

1. Overview of document

This document provides details of the Conservation and Management Advice for the Solway Firth Special Protection Area (SPA). Solway Firth SPA amalgamates and extends the previously named Upper Solway Flats and Marshes SPA, and henceforth is the new name for this extended SPA. The document is divided into eight main sections. The introduction in section 2 gives an overview of the Solway Firth SPA and its contribution in terms of conservation and wider benefits. Section 3 provides an overview of the roles of the various bodies involved with advising, regulating and managing the marine protected area. Section 4 describes the protected features and their condition, and section 5 introduces the Conservation Objectives for the site. Section 6 describes the threats and pressures to which the protected features are sensitive, and section 7 provides the management advice for these activities. Section 8 identifies what further research and surveys may be required to increase our understanding of how the protected features utilise the marine protected area.

Annex 1 sets out the Solway Firth SPA Conservation Objectives. Annex 2 provides supporting information relating to the protected features.

Throughout this document the term Special Protection Area (SPA) is used in relation to the site name, e.g. Solway Firth SPA or in discussion of the specific legislation relating to the site. Otherwise the term Marine Protected Area (MPA) is used when discussing the MPA network generally. The term *qualifying features* is used in the Conservation Objectives to refer to those Annex 1 and regularly occurring migratory bird species that the Solway Firth SPA has specifically been designated to protect. Within the wider document text, the term *protected features* is used to refer both to these specific site features and more generally to species or habitats protected through MPA designations.

2. Introduction

2.1 Purpose statement

The Solway Firth SPA has been designated to protect 28 species of non-breeding, wintering and passage species of waterfowl (including waders, divers, geese, and seaducks), gulls, and their supporting habitats. By doing so it contributes to the UK and OSPAR MPA networks, the conservation of the wider marine environment around the UK, and progress towards Good Environmental Status within the North-East Atlantic marine region.

The main purpose of the Solway Firth SPA is to contribute to the [Favourable Conservation Status](#) of the protected features in the Atlantic Biogeographic Region. The Conservation Objectives form the framework for establishing appropriate management measures and assessing all future plans and projects that have the potential to affect the protected features of the MPA.

2.2 Conservation benefits

The conservation benefits for the Solway Firth SPA are:

- Protecting the second largest wintering concentration of red throated diver (over 3% of GB population) in Scotland, whooper swan (4% of GB population), golden plover (2% of GB population) and bar-tailed godwit (8% of GB population). All are Annex 1 rare and vulnerable species.
- Protecting almost the entire Svalbard population of barnacle geese that winters in GB (an Annex 1 rare and vulnerable species).

- Protecting the largest marine population in GB of goosander (over 1.2% of GB population) in the non-breeding season.
- Protecting regularly occurring migratory species including: northern pintail, greater scaup, Eurasian oystercatcher, red knot, ringed plover, common redshank, and Eurasian curlew.
- The SPA also supports important wintering assemblage populations of: shelduck, teal, shoveler, common scoter, goldeneye, grey plover, lapwing (the largest population of this species on a Scottish coastal site), dunlin, sanderling, turnstone, and cormorant. The site as a whole routinely supports over 120,000 non-breeding water birds.
- Protecting the second largest roost site for wintering black-headed gull, common gull, and herring gull in Scotland and the only concentration of wintering gulls in north-west GB.
- Protecting the third largest intertidal area in the UK and one of the least developed estuaries in Europe.
- Protecting the diverse intertidal and marine habitats that support a diversity of fish, and invertebrates, where the protected features can feed, moult and roost.

2.3 Wider benefits

The protected features of the Solway Firth SPA provide ecosystem services locally and to the wider marine and estuarine ecosystems. We describe these ecosystem services in terms of their functions (the support or provision of something to the wider ecosystem e.g. habitat, nutrient cycling, sediment stabilisation) and natural resources (e.g. fish and shellfish, aggregates, wildlife), which in turn lead to benefits for people.

Figure 1 illustrates how the protected features of the Solway Firth SPA contribute to benefits for people. There can be many complex interactions and dependencies amongst the protected features, their functions, associated natural resources and the benefits we gain from them.

The protected features together, especially when taken within the context of the whole MPA and/or local ecosystem, contribute to certain functions (e.g. biomass production and nutrient cycling) more than others. The contributions made by the protected features to these functions are fundamental to the continued supply of natural resources and benefits associated with this MPA, and to the long-term health of the protected features themselves.

The Solway Firth is one of the largest, least industrialised and most natural sandy estuaries in Europe, it is a complex site which has resulted in the development of diverse marine habitats that support a variety of natural resources. The extensive mudflats and sandflats of the Solway support a diversity of invertebrates including shellfish and a wide range of pelagic and demersal fish species (including juveniles).

The seascapes and wildlife within the MPA provide opportunities for tourism, recreation and wildlife watching (particularly bird watching), all of which encourage local jobs and businesses. The waders and waterfowl attract visitors to the Caerlaverock National Nature Reserve (NNR), the Wildfowl and Wetland Trust Caerlaverock Wetland centre, Mersehead RSPB Reserve, Solway Coast Area of Outstanding Natural Beauty, and Campfield Marsh RSPB Reserve in the autumn and winter months, and are key visitor attractions during the tourist low season. Wildfowling permits over a designated zone within part of the NNR are managed through byelaws. More widely wildfowling is undertaken by right on the foreshore on both sides of the Firth and attracts visitors across the winter months too. Fisheries and supporting businesses from local communities within and around the MPA utilise and benefit from the wildlife and the area's fish and shellfish resources. The Solway Firth SPA is valued by the local community. The complexity of the habitats and waters around this cross-border

site, create a unique coastal environment and a sense of place. Further benefits relating to health and well-being (e.g. sailing and walking), food and nutrition also arise from the site's natural resources, resulting in a place where communities and visitors can spend time connecting with and enjoying nature.

Some benefits that arise from the functions and natural resources of the MPA are high, due to the large numbers of birds present (e.g. nutrient cycling and biomass production), although some are of greater importance for this MPA and the people that use it. There is potential for benefits to be enhanced. This may be achieved by improving the quantity or quality (health) of the protected features themselves and/or through promoting, for example, more recreational enjoyment or use of natural resources that is compatible with the site's Conservation Objectives.

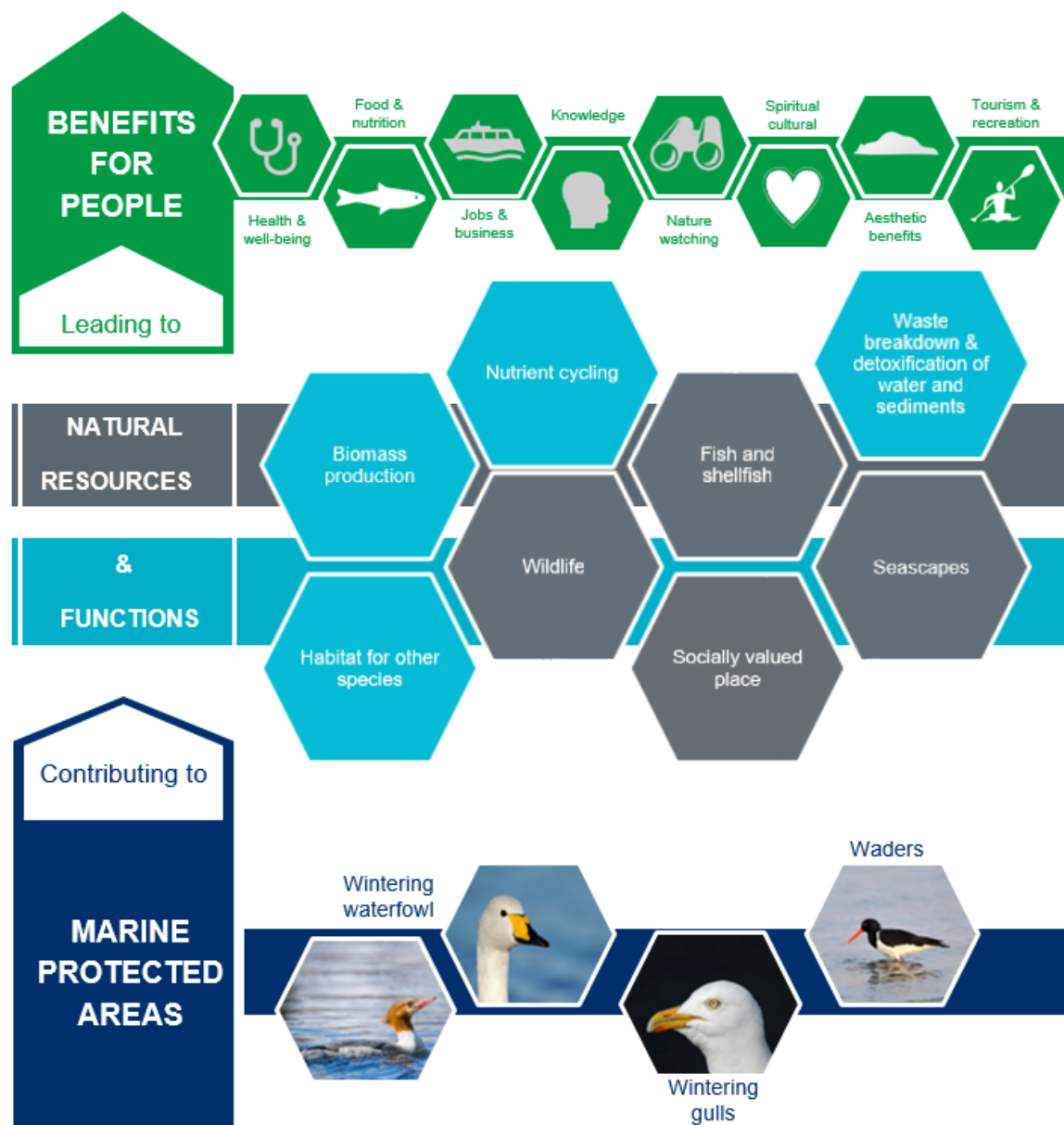


Figure 1. Benefits to people associated with protected features of the Solway Firth SPA.

2.4 Contribution to policy commitments

Managing this MPA to maintain, and where appropriate restore, the protected features in favourable condition, will ensure the continued provision of the benefits above as well as the site's contribution to:

- An ecologically coherent network of MPAs which are well managed under the OSPAR convention and national legislation.
- Achieving Favourable Conservation Status for the protected features in the Atlantic Biogeographic Region.
- Progress towards achieving Good Environmental Status in relation to maintaining biological diversity, and ensuring marine food web abundance and diversity.
- Making a significant contribution to the protection, enhancement and health of the marine area under the National Marine Plan.
- Restoring marine and coastal ecosystems and increasing the environmental status of our seas under the Scottish Biodiversity Strategy.
- Helping to adapt to climate change under The Scottish Climate Change Adaptation Programme.
- Contributing to the UK government's 25 Year Environment Plan to improve the environment.

3. Roles

This document provides advice for the Solway Firth SPA in relation to activities that may affect the protected features. More detailed advice can be provided to public authorities to inform their decision making as required. In doing this, our aim is to ensure the Conservation Objectives for the protected features are met.

The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland) (the "Habitats Regulations") under Regulation 33(2), and Regulation 37(3) of the Conservation of Habitats and Species Regulations 2017 make special provisions for the protection of European marine sites, requiring SNH (now referred to as NatureScot) and Natural England to advise other relevant authorities of the Conservation Objectives for a site, and also of the operations which may cause deterioration of the habitats or species, or disturbance of species protected in the SPA.

It is the role of the relevant and competent authorities¹ to ensure that the activities they regulate, permit or license do not hinder the achievement of the Conservation Objectives of the Solway Firth SPA. The management advice in this document is provided jointly by NatureScot and Natural England to assist authorities in managing the activities outlined in

¹ A relevant authority is a body or authority that has a function in relation to land or waters within or adjacent to the site (Regulation 5) and include: a nature conservation body; a local authority; water undertakers; a navigation authority; a harbour authority; a lighthouse authority; SEPA; the Environment Agency; the Marine Management Organisation; a district salmon fishery board; the River Tweed Commission; and a local fisheries committee. All relevant authorities are competent authorities. A competent authority is defined in Regulation 6 as "any Minister, government department, public or statutory undertaker, public body of any description or person holding a public office". In the context of a plan or project, the competent authority is the authority with the power or duty to determine whether or not the proposal can proceed.

Table 2, section 7, and undertaking Habitats Regulations Appraisals/Assessments of plans and projects.

Stakeholders can provide additional evidence to support the development of management including local knowledge of the environment and of activities. This will contribute to the development of well-designed and effective management measures.

4. Protected features and status

The Solway Firth SPA has been selected to become part of the UK's SPA network, contributing to Scotland's MPA network, which in turn has been established to help conserve and recover a range of the UK's important marine habitats, wildlife, geology and landforms.

The protected features of the Solway Firth SPA are protected within the SPA throughout the year, irrespective of the season for which they qualified as a protected feature.

Table 1 provides a summary of the protected features within the MPA, their condition within the site (where known) based on the latest NatureScot [Site Condition Monitoring](#) assessment, and the broader conservation status of the protected features. For waterfowl and wader features, feature condition was also checked against the most recent WeBS data² (2015-2019 peak average) for the Solway Estuary. The Solway Firth SPA also has as a qualifying feature an assemblage of non-breeding waterbirds. This assemblage is comprised of all the species listed in Table 1. In England, the assemblage also includes any other non-breeding waterbird species that use the site.

Table 1. Protected features and condition for the Solway Firth SPA.

Feature condition refers to the condition of the protected feature assessed at a site level. Broader conservation status is the overall conservation status of the feature within the UK and Europe. No assessment on the condition of the feature at the Marine Atlantic Biogeographic Region scale is available.

Protected Feature	Feature condition at site	Assessment date	Broader conservation status	
			UK ³	European region ⁴
Red-throated diver (non-breeding)	Favourable ⁵	<i>Not yet assessed</i>	Green	Least Concern
Whooper swan (non-breeding)	Favourable Recovered	18 March 2007	Amber	Least Concern

² As obtained through the [WeBS Report online](#) service.

³ Based on Birds of Conservation Concern 5 (BoCC5), for further details on definitions see Stanbury *et al.* 2021.

⁴ Based on BirdLife International, 2021.

⁵ The protected features have not been assessed since designation, however corroborative evidence suggest there is no reason to suspect deterioration in condition since site selection (SNH, 2019). Hence, the feature condition is provided as condition at site selection.

Protected Feature	Feature condition at site	Assessment date	Broader conservation status	
			UK ³	European region ⁴
Barnacle goose (non-breeding)	Favourable Maintained	18 Mar 2007	Amber	Least Concern
Golden plover (non-breeding)	Favourable Maintained	18 Mar 2007	Green	Least Concern
Bar-tailed godwit (non-breeding)	Unfavourable	1 Mar 2017 and WeBS 2015-2019 average	Amber	Least Concern
Pink-footed goose (non-breeding)	Favourable Maintained	18 Mar 2007	Amber	Least Concern
Shelduck (non-breeding)	Favourable Maintained	31 Mar 2015	Amber	Least Concern
Teal (non-breeding)	Favourable	Condition assessed from WeBS 2015-2019 average	Amber	Least Concern
Pintail (non-breeding)	Favourable Maintained	31 Mar 2015	Amber	Vulnerable
Shoveler (non-breeding)	Favourable	Condition assessed from WeBS 2015-2019 average	Amber	Least Concern
Scaup (non-breeding)	Unfavourable	Condition assessed from WeBS 2015-2019 average	Red	Least Concern
Common scoter (non-breeding)	Favourable ⁵	<i>Not yet assessed</i>	Red	Least Concern
Goldeneye (non-breeding)	Unfavourable	18 Mar 2007 and WeBS 2015-2019 average	Red	Least Concern
Goosander (non-breeding)	Favourable ⁵	<i>Not yet assessed</i>	Green	Least Concern
Oystercatcher (non-breeding)	Favourable	8 Mar 2016	Amber	Vulnerable

Protected Feature	Feature condition at site	Assessment date	Broader conservation status	
			UK ³	European region ⁴
Knot (non-breeding)	Unfavourable	11 Aug 2015	Amber	Least Concern
Ringed plover (passage and non-breeding)	Favourable Maintained	2 Mar 2017	Red	Least Concern
Grey plover (non-breeding)	Unfavourable	Condition assessed from WeBS 2015-2019 average	Amber	Least Concern
Lapwing (non-breeding)	Unfavourable	09 Mar 2016 and WeBS 2015-2019 average	Red	Vulnerable
Dunlin (non-breeding)	Favourable Declining	8 Mar 2016	Red	Least Concern
Sanderling (non-breeding)	Favourable maintained	02-Mar-2017	Amber	Least Concern
Redshank (non-breeding)	Favourable Maintained	10 Aug 2015	Amber	Vulnerable
Turnstone (non-breeding)	Unfavourable	Condition assessed from WeBS 2015-2019 average	Amber	Least Concern
Curlew (non-breeding)	Unfavourable	27-Jan-2016	Red	Near Threatened
Cormorant (non-breeding)	Favourable ⁵	<i>Not yet assessed</i>	Green	Least Concern
Black-headed gull (non-breeding)	Favourable ⁵	<i>Not yet assessed</i>	Amber	Least Concern
Common gull (non-breeding)	Favourable ⁵	<i>Not yet assessed</i>	Amber	Least Concern
Herring gull (non-breeding)	Favourable ⁵	<i>Not yet assessed</i>	Red	Least Concern

5. Setting Conservation Objectives

5.1 Background

Under Regulation 33(2) of the Habitats Regulations and Regulation 37(3) of the 2017 Regulations, NatureScot and Natural England respectively have responsibility for providing the Conservation Objectives for European marine sites in their relevant territorial waters. These site-level Conservation Objectives seek to define the contribution that each SPA should make to achieving Favourable Conservation Status for the protected features. They provide the framework for the setting of site conservation measures (management) and for the Habitats Regulations Appraisal of projects and plans.

The Conservation Objectives for the Solway Firth SPA are provided in Annex 1.

5.2 Relationship between feature condition and Conservation Objectives

The Conservation Objectives seek to *maintain* protected SPA features where evidence exists that it is in favourable condition in the site, or where there is uncertainty concerning the assessed condition of a feature (see section 4) but no reason to suspect deterioration in condition since designation. Where evidence exists that a feature is declining and/or damaged and therefore not in a favourable condition in the site, the Conservation Objectives will seek to *restore* the protected feature.

The following protected features are in favourable condition at the Solway Firth SPA: red-throated diver, whooper swan, barnacle goose, golden plover, pink-footed goose, shelduck, teal, pintail, shoveler, common scoter, goosander, oystercatcher, ringed plover, cormorant, dunlin, redshank, sanderling, black-headed gull, common gull, and herring gull. Therefore, the Conservation Objectives seek to *maintain* this condition.

The following protected features are in unfavourable condition at the Solway Firth SPA: bar-tailed godwit, scaup, lapwing, grey plover, turnstone, knot, curlew and goldeneye and will therefore require remedial action to address pressures on the SPA which are a cause or contributing to the decline of the population in the SPA. Therefore, the Conservation Objectives seek to *restore* the condition for the above species.

Bar-tailed godwit have declined by 91% from designation of 4800 birds (1986-1991) to 425 birds (average 2015-2019). The decline seems to reflect a regional-wide (North West region and SEPA Southwest area) and GB-wide decline in wintering bar-tailed godwits. Factors in their breeding grounds and wider-scale climate factors may be having an influence on the numbers and distribution of bar-tailed godwit wintering on the Solway Firth SPA. At Solway Firth SPA this species is also known to be sensitive to disturbance, including in relation to wildfowling. However, the reasons for their decline at the Solway Firth SPA are not clear, but due to their decrease at the site the Conservation Objectives seek to *restore* favourable condition.

Goldeneye have declined by 82% from the baseline population of 300 (1986-1991) at designation to an average peak of around 50 birds (average 2015-2019). The decline seems to be reflecting a nationwide decline in goldeneye, such that they are now on the red list of Birds of Conservation Concern. Improvements to inshore water quality across the UK, including on sites such as the Solway Firth, is thought to be a potential reason for declines in concentrations of goldeneye. Factors in their breeding grounds and wider-scale climate factors may also be having an influence on the numbers and distribution of goldeneye

wintering on the Solway Firth SPA. There may also be a question on whether WeBS counts are the most suitable survey methodology for this species. Reasons for their decline at the Solway Firth SPA are not clear, but due to their decrease at the site the Conservation Objectives seek to *restore* favourable condition.

Curlew have declined by 67% from a baseline population of 6700 birds at designation (1986-1991) to 2183 birds (average 2015-2019). Although the regional and GB trends of wintering curlews are also in decline, [WeBS alerts](#) are a red alert for this species within the Solway Firth region, suggesting that site-specific pressures may be worsening the decline at this site. Curlew are known to be sensitive to disturbance, which may be occurring at this site. Reasons for their decline at the Solway Firth SPA are not clear, but due to their decrease at the site the Conservation Objectives seek to *restore* favourable condition.

Scaup have declined by 77% since baseline citation population of 2,300 (1986-1991) to 535 birds (average 2015-2019). Scaup numbers across the UK increased by 15% between 1980/81-2016/17, however their short-term trend (2005/06-2016/17) shows a large decline of around 52%. Reasons for their steep decline at the Solway Firth SPA are not clear, but due to their decrease at the site the Conservation Objectives seek to *restore* favourable condition.

Lapwing have declined by 51% since baseline population of around 8600 (1991-1996) to around 4200 (average 2015-2019). The UK-wide trend shows that lapwing numbers have increased overall in their long-term trend by around 223% between 1980/81-2016/17, though their short-term trend shows a 23% decline (2005/06-2016/17). [WeBS alerts](#) are a red alert for this species within the Solway Firth region, suggesting that site-specific pressures may be worsening the decline at this site. Reasons for their decline at the Solway Firth SPA are not clear, but due to their decrease at the site the Conservation Objectives seek to *restore* favourable condition.

Grey plover have decreased by 59% from the baseline citation population, with an average peak of 292 individuals (average 2015-2019) compared to 720 individuals (1986-1991). The UK-wide trend shows that grey plover numbers have increased overall in their long-term trend by around 56% between 1980/81-2016/17, with their short-term trend showing their population has stabilised (2005/06-2016/17). [WeBS alerts](#) are a red alert for grey plover at Solway Firth due to a long-term decline of 70%. Due to the difference in decline at the site compared to the UK wide trends, it suggests that site-specific pressures may be contributing to the decline at this site. Reasons for their decline at the Solway Firth SPA however are not clear, but due to their decrease at the site the Conservation Objectives seek to *restore* favourable condition.

Knot have declined by 59% from the baseline citation population of 15,300 birds (1986/87-1990/91) to around 6300 birds (2015-2019). The UK-wide trend shows that knot numbers have increased slightly in their long-term trend by around 14% between 1980/81-2016/17. The reasons for the decline in knot at the Solway Firth SPA are uncertain. The fact that their trend is decreasing at the site, whereas the population across the UK has increased suggests there may be site-specific issues worsening the decline at this site that need considered. Declines in mussel and cockle prey can decrease individual body condition and increase mortality and mussel beds at the Solway Firth SPA currently have low stocks. Knot are also highly sensitive to disturbance. Due to their decrease at the site, the Conservation Objectives seek to *restore* favourable condition.

Turnstones at the Solway Firth SPA have decreased by 63% from the baseline citation population of 600 (average 1986 to 1991) to around 220 (2015-2019). The UK-wide trend shows that turnstone numbers have remained relatively stable (around 3% increase) in their long-term trend (1980/81-2016/17), but have shown a short-term (2005/06-2016/17) decline of around 20%. It is not clear what the reasons for this may be but due to their decrease at the site, the Conservation Objectives seek to *restore* favourable condition.

5.3 Conservation priorities

On the rare occasion where the need to favour the management of one protected feature of a site over another, conservation priority will be given to the most important species/habitats to take action for and/or the most important or urgent measures to be taken.

For the Solway Firth SPA, red-throated diver, whooper swan, barnacle goose, golden plover and bar-tailed godwit are Annex 1 species and considered rare and vulnerable. The conservation requirements for Annex 1 species should take precedence over the regularly occurring migratory species (the remaining wintering waterfowl, wader, and gull qualifying features).

There are currently no apparent management conflicts between the protected features within the Solway Firth SPA.

5.4 Overlapping Marine Protected Areas

The following MPAs overlap with the Solway Firth SPA:

- Solway Firth Special Area of Conservation (SAC)
- Upper Solway Flats and Marshes RAMSAR site.
- Upper Solway Flats and Marshes Site of Special Scientific Interest (SSSI)
- Caerlaverock National Nature Reserve (NNR)
- Solway Firth Marine Conservation Zone (MCZ)

Conservation measures in the overlapping marine protected areas need to ensure the Conservation Objectives of both Solway Firth SPA and the overlapping sites are met. There are no apparent management conflicts between the protected features of the Solway Firth SPA and the overlapping MPAs.

Site information for the MPAs overlapping the Solway Firth SPA, including the Conservation Objectives for the overlapping sites mentioned above, are available on [SiteLink](#). Further information on the Solway Firth MCZ is also [online](#).

6 Feature sensitivity

The following section provides an overview of the pressures associated with human activities that are most relevant to the protected features, in the season for which they are designated. Further information on feature sensitivity, for marine birds, will be made available on Marine Scotland's Feature Activity Sensitivity Tool (FeAST) (Scottish Assessment Only). The information in FeAST will reflect NatureScot's current understanding of the interactions between activities, pressures and features. It will highlight that activities can give rise to a range of pressures, which the protected features may be sensitive to. Our assessment of sensitivity is based on a feature's tolerance (response to change) and its ability to recover.

Sensitivity based on the FeAST methodology may differ from Natural England's Advice on Operations. Natural England can be consulted directly for further advice on pressures and feature sensitivity relating to activities on the English side of the site.

6.1 Red-throated diver (non-breeding)

Red-throated divers are considered sensitive to mortality through entanglement in various types of fishing gears and incidental bycatch (Mendel *et al.* 2008; Dierschke *et al.* 2012). Red-throated divers exhibit behavioural sensitivity to visual disturbance to vessel movements (Jarrett *et al.* 2018). During the breeding season they are known to exhibit strong displacement associated with various marine developments (Furness *et al.* 2013; Cook & Burton, 2010) which may also be a sensitivity exhibited during the non-breeding season. Red-throated divers are also sensitive to pressures affecting prey availability (Guse *et al.* 2009). (See also *Sandeel sensitivity assessment in FeAST*).

6.2 Whooper swan (non-breeding)

Whooper swans are considered sensitive to collision with overhead power lines (Kear, 2005) and potential collision and displacement effects from wind turbines (Larsen & Clausen, 2002; Rees, 2012). Illegal shooting is thought to occur across the range of the species (Newth *et al.* 2011). Other potential threats may include lead poisoning through ingestion of lead shot and fishing weights, oil pollution, and disease such as avian influenza (see BirdLife International, 2020). Whooper swans are also sensitive to habitat degradation and loss (e.g. the reclamation of coastal and inland wetlands) (Kear, 2005). Whooper swans show sensitivity to human disturbance (Ma & Cai, 2002; Rees *et al.* 2005).

6.3 Barnacle goose (non-breeding)

Svalbard barnacle geese are sensitive to poisoning by lead shot contamination, oil pollution and disease (see BirdLife International, 2020). The species is particularly susceptible to avian influenza ([APHA](#)), with around a third of its UK wintering population being lost in 2021/2022, so may be threatened by future outbreaks of the virus. This population of barnacle geese is protected from hunting throughout the flyway, although scaring and a low level of shooting under licence is implemented in Scotland to prevent serious agricultural damage; this is not thought to threaten the population (Jensen *et al.* 2018).

6.4 Eurasian golden plover (non-breeding)

Golden plovers are threatened by hunting, particularly in the winter period (del Hoyo *et al.* 1996). Golden plovers are still a legal quarry species in GB but population level impacts of this threat is unknown. Golden plovers may also be susceptible to disturbance. Any pressures which would affect their prey resource or their habitat extent would also have a subsequent effect on this species.

6.5 Bar-tailed godwit (non-breeding)

Bar-tailed godwits are sensitive to habitat degradation and loss (e.g. the reclamation of coastal and inland wetlands, loss of estuaries and mudflats, pollution etc.) (Birdlife International, 2020). This species is sensitive to human disturbance (Goodship & Furness, 2019). Bar-tailed godwits are also sensitive to nutrient enrichment at wintering sites which can have effects on their prey (Estrella *et al.* 2011). This species may also be susceptible to disease, such as avian influenza (Melville & Shortridge, 2006).

6.6 Pink-footed goose (non-breeding)

Pink-footed geese wintering in the UK are hunted across their flyway, and they are a quarry species in the open season in Scotland and England. The effects of wildfowling on their UK wintering population is currently not known (Humphreys *et al.* 2015). Changes in agricultural practice can affect food availability for pink-footed geese, and disturbance during winter can disrupt their ability to forage (e.g. being scared off fields where they are feeding). Pink-footed geese have been assessed as being sensitive to human disturbance, including disturbance as a result of hunting activity (Goodship & Furness, 2019). The species is also susceptible to avian influenza ([APHA](#)) so may be threatened by outbreaks of the virus.

6.7 Common shelduck (non-breeding)

Shelduck are vulnerable to effects of habitat loss (Kear, 2005). This species may also be susceptible to disease, such as avian influenza (Melville & Shortridge, 2006). Shelduck are sensitive to disturbance, both from the shore and when within the water (Goodship & Furness, 2019).

6.8 Common teal (non-breeding)

Teal are vulnerable to hunting pressures, especially in their winter grounds (del Hoyo *et al.* 1992). Teal are a legal quarry species in GB but population level impacts of this threat is unknown. Teal are sensitive to habitat degradation and loss (e.g. the reclamation of coastal and inland wetlands, loss of estuaries and mudflats etc.) (Birdlife International, 2020). This species is sensitive to disturbance from recreation, hunting and construction works (BirdLife International, 2020). This species may also be susceptible to disease, such as avian influenza (Melville & Shortridge, 2006) and avian botulism (Rocke, 2006).

6.9 Northern pintail (non-breeding)

Pintail are vulnerable to hunting pressures (Scott & Rose, 1996). Pintail are a legal quarry species in GB but population level impacts of this threat is unknown. Pintail are sensitive to habitat degradation and loss (e.g. the reclamation of coastal areas and changing wetland practices) (Birdlife International, 2020). Pintail are also sensitive to oil pollution and ingested contaminants (BirdLife International, 2020). This species may also be susceptible to disease, such as avian influenza (Melville & Shortridge, 2006) and avian botulism (Rocke, 2006).

6.10 Northern shoveler (non-breeding)

Shoveler are vulnerable to collisions with power lines (Malcolm, 1982). Shoveler are also vulnerable to hunting pressures and to ingestion of lead shot and other contaminants (BirdLife International, 2020). Shovelers are a legal quarry species in GB but population level impacts of this threat is unknown. They are sensitive to habitat degradation and loss (Kear, 2005). This species may also be susceptible to disease, such as avian influenza (Melville & Shortridge, 2006) and avian botulism (Forrester *et al.* 1980).

6.11 Greater scaup (non-breeding)

Scaup populations have been identified as vulnerable to: changes in availability of favoured bivalve prey associated with harvesting or modification of benthic habits through dredging; chronic oil pollution and spills; and, disturbance of their near-shore roost sites associated with recreational activities (Mendel *et al.* 2008). Scaup populations are also vulnerable to impact through fatal entanglement in set net fisheries (Mendel *et al.* 2008; Žydelis *et al.* 2013). They are particularly vulnerable to bycatch at depth near the seabed, with some areas of relatively high potential vulnerability in the winter months encompassing areas with

high scaup densities (Bradbury *et al.* 2017). Scaup show sensitivity to visual disturbance associated with vessel movements (Mendel *et al.* 2008).

6.12 Common scoter (non-breeding)

Common scoters are considered sensitive to mortality through entanglement in fishing gears and incidental bycatch (Mendel *et al.* 2008; Bradbury *et al.* 2017). Common scoter are also highly vulnerable to chronic oil pollution and spills (Mendel *et al.* 2008). A number of sources highlight the behavioural sensitivity of scoters to vessel movements (Kaiser *et al.* 2006; Schwemmer *et al.* 2011). They are assessed as having high potential vulnerability to disturbance and displacement due to marine development (McCluskie *et al.* 2012; Dierschke *et al.* 2006). Common scoter are vulnerable to changes in availability of their favoured prey, driven by climate change, commercial fisheries, or other environmental pressures (Mendel *et al.* 2008; Baptist & Leopold, 2009).

6.13 Common goldeneye (non-breeding)

Goldeneye are a legal quarry species in Great Britain but population level impacts of this threat is unknown (Furness, 2016). Goldeneye have been reported as bycatch in set net fisheries in the Baltic (ICES, 2013). Goldeneye populations at some major freshwater wintering sites have been impacted by nutrient enrichment (Allen *et al.* 2004; Tománková *et al.* 2013) and such pressures could potentially increase the importance of coastal sites in some areas. The species is vulnerable to pollution incidents from both marine and terrestrial sources. Any activity which would cause a reduction in their favoured shellfish prey items would have a subsequent effect on the goldeneye.

6.14 Goosander (non-breeding)

Goosander have been reported as bycatch in set net fisheries in the Baltic (ICES, 2013), but population level impacts of this threat is unknown. Goosanders are also subject licensed control in the UK but population level impacts are not known. This species has also demonstrated sensitivity to pollution (Kear, 2005; Grishanov, 2006) and may be susceptible to disease. Goosander are also assessed as being sensitive to disturbance (Goodship & Furness, 2019).

6.15 Eurasian oystercatcher (non-breeding)

Oystercatchers are sensitive to habitat degradation, land reclamation and prey loss, particularly where it leads to the disappearance of intertidal mussel and cockle beds (e.g. Ens, 2006; van de Pol *et al.* 2014). Coastal erosion and flooding has also caused habitat losses in some areas (Melville *et al.* 2014). They have also shown sensitivity to pollution as a result of coastal activities (Kelin & Qiang, 2006). Oystercatchers are susceptible to disease such as avian influenza, so may be threatened by future outbreaks of the virus (Melville & Shortridge, 2006). Oystercatchers show sensitivity to human disturbance, based on a review of disturbance distances (Goodship & Furness, 2019).

6.16 Red knot (non-breeding)

Knot are sensitive to habitat degradation, dredging, and land reclamation, particularly where it leads to the disappearance of intertidal habitat and their prey (del Hoyo *et al.* 1996; Leyrer *et al.* 2014). This species is also sensitive to overexploitations of shellfish which leads to reductions in their prey availability (del Hoyo *et al.* 1996). Several studies indicate that this species is highly sensitive to disturbance, especially at roost sites and at their main estuarine areas (Woodward *et al.* 2015).

6.17 Ringed plover (non-breeding)

Plovers are sensitive to oil pollution, disease, predation and changes of coastline habitat use (BirdLife International, 2020). Plovers are also sensitive to disturbance, both from shore-based and water-based sources (Goodship & Furness, 2019). Any pressure which would result in a reduction of prey for plovers would also affect their populations.

6.18 Grey plover (non-breeding)

Plovers are sensitive to oil pollution, disease, predation and changes of coastline habitat use (BirdLife International, 2020). Plovers are also sensitive to disturbance, both from shore-based and water-based sources (Goodship & Furness, 2019). Any pressure which would result in a reduction of prey for plovers would also affect their populations.

6.19 Northern lapwing (non-breeding)

Some countries still hunt lapwing (BirdLife International, 2020), which may have a subsequent effect on their UK wintering population. This species is sensitive to habitat loss and degradation due to changes in agricultural practice and coastline changes, which can cause a subsequent change in their optimal foraging habitats. Lapwings are also vulnerable to oil pollution and disease, such as avian botulism (Hubalek *et al.* 2005; Grishanov, 2006). They may also be susceptible to predation (BirdLife International, 2020). Lapwing are sensitive to disturbance, both from human disturbance at the shore and from watercraft along a shoreline (Goodship & Furness, 2019).

6.20 Dunlin (non-breeding)

Dunlin are vulnerable to any changes in their wintering estuarine habitat (e.g. through land reclamation or through invasive non-native plant species) which reduces the amount of foraging area available to them (del Hoyo *et al.* 1996). The species is also threatened by disturbance on intertidal mudflats from construction work (UK) and foot-traffic on footpaths (Burton *et al.* 2002a), as well as from watercraft along the shoreline (Goodship & Furness, 2019). Dunlin are also susceptible to avian influenza and is therefore threatened by outbreaks of the virus (Melville & Shortridge, 2006).

6.21 Sanderling (non-breeding)

Sanderling are sensitive to pollution and in any degradation to their estuarine or wetland habitats (BirdLife International, 2020). Sanderling are sensitive to human, vehicle, and watercraft disturbance on and along shorelines (Goodship & Furness, 2019). Any pressure which would result in a reduction of prey for sanderling would also affect their populations.

6.22 Common redshank (non-breeding)

Redshank are sensitive to habitat loss and degradation, (e.g. through land reclamation, development, agricultural intensification, encroachment of grasses such as *Spartina* on mudflats etc.) (del Hoyo *et al.* 1996), and growth of macro algae (*Ulva* spp.) on mudflats due to eutrophication. The species is also threatened by disturbance on intertidal mudflats from construction work and recreation activities on land (Burton *et al.* 2002a, b), as well as from watercraft along the shoreline (Goodship & Furness, 2019). The species is also susceptible to avian influenza so may be threatened by future outbreaks of the virus (Melville & Shortridge, 2006).

6.23 Ruddy turnstone (non-breeding)

Turnstones have sensitivity to human disturbance, both from pedestrians and watercrafts along a shoreline (Goodship & Furness, 2019). The species is susceptible to avian influenza so may be threatened by future outbreaks of the virus (Melville & Shortridge, 2006). Turnstones are vulnerable to changes in availability of their favoured prey, driven by coastal habitat changes or other environmental factors (BirdLife International, 2019).

6.24 Eurasian curlew (non-breeding)

Curlews may be vulnerable to renewable energy project development, although information on this is lacking (Pearce-Higgins *et al.* 2009). Activities taking place along or near the shoreline have also caused local population declines (e.g. mechanised shellfish harvesting, see Taylor & Dodd, 2013). Curlew populations have also been negatively impacted by hunting (Birdlife International, 2020). Curlew are sensitive to changes in their habitat (e.g. flooding of mudflats and saltmarshes for tidal barrage construction) and the subsequent effects it then has on reductions of food resources or access/ displacement from wintering grounds (see literature review in Woodward *et al.* 2015). Curlew are sensitive to disturbance on intertidal mudflats by humans, watercraft, and construction work (Burton *et al.* 2002a; Goodship & Furness, 2019). They may be at risk from water quality changes which cause reductions in benthic invertebrate densities at sites (e.g. improvement in quality close to sewage outfalls) (Burton *et al.* 2002b).

6.25 Great cormorant (non-breeding)

Cormorants are susceptible to being bycatch (BirdLife International, 2020). Cormorants are also subject to licensed control as well as being hunted in parts of their range. It is not fully understood how hunting and licensed control affects their populations. Cormorants may have sensitivity to synthetic and non-synthetic compounds, and marine litter (e.g. Acampora, 2017; O'Hanlon *et al.* 2017). Cormorants may be vulnerable to collision from marine renewable developments, as some studies show they are attracted to windfarm developments as roosting sites (Vanerman *et al.* 2016). This species is sensitive to displacement for some activities (e.g. wave, tidal, seaweed harvesting, aggregate extraction, transport, encroachment of banks) but not all (e.g. wind and oil & gas) (MMO, 2018). They are also susceptible to diseases, such as avian influenza (Lee *et al.* 2017).

6.26 Black-headed gull (non-breeding)

Black-headed gulls may be sensitive to collision with offshore wind turbines (Furness, 2016; Bradbury *et al.* 2014), oil spills (Mendel *et al.* 2008), and accidental bycatch in fishing gear or other plastic waste (Mendel *et al.* 2008; Žydelis *et al.* 2013). Black-headed gulls may be disturbed at sea by shipping traffic (BirdLife International, 2020). Gull species may also be vulnerable to disease (Hubalek *et al.* 2005), including avian flu ([APHA](#)). Information is lacking on disturbance in the marine environment for these smaller gull species. Any pressures which would affect their prey resource would have a subsequent effect on these species as they are sensitive to depletion of their prey resources (Mendel *et al.* 2008).

6.27 Common gull (non-breeding)

Common gulls may be sensitive to collision with offshore wind turbines (Furness, 2016; Bradbury *et al.* 2014), oil spills (Mendel *et al.* 2008), and accidental bycatch in fishing gear or other plastic waste (Mendel *et al.* 2008; Žydelis *et al.* 2013). Common gulls may be disturbed at sea by shipping traffic (BirdLife International, 2020). Gull species may also be vulnerable to disease (Hubalek *et al.* 2005), including avian flu ([APHA](#)). Information is lacking on disturbance in the marine environment for these smaller gull species. Any pressures which

would affect their prey resource would have a subsequent effect on these species as they are sensitive to depletion of their prey resources (Mendel *et al.* 2008).

6.28 Herring gull (non-breeding)

Herring gulls may be susceptible to disease (including avian flu ([APHA](#))), persecution and licensed control (Coulson, 2015), which could have subsequent effects on their population. Gulls are vulnerable to collision with marine development above water (Furness *et al.* 2013). Other pressures include accidental bycatch in fishing nets (Žydelis *et al.* 2013), oil pollution (Mendel *et al.* 2008) and organochlorine pollution (Camphuysen *et al.* 2010). Gulls may also be displaced by marine development. Herring gulls are sensitive to large-scale changes in prey availability (e.g. Camphuysen, 2013; Bicknell *et al.* 2013).

7 Management

7.1 Conservation Measures

The following conservation measures are currently in place for the Solway Firth SPA:

- The Habitats Regulations require all plans or projects that may have an effect on the protected features of a SPA to be assessed against the Conservation Objectives for that site. This process is known as a Habitats Regulations Appraisal/Assessment (HRA). An HRA is a statutory procedure that ensures the integrity of the site is maintained. It also provides an opportunity to consider appropriate mitigation that can reduce impacts, avoid adverse effects and permit plans or projects to proceed having taken full account of the protected features of an SPA.
- Part of the Solway Firth SPA is notified as a Site of Special Scientific Interest (SSSI) and management changes described on the list of [Operations Requiring Consent](#) must have prior consent from NatureScot or Natural England.
- Caerlaverock is declared as a National Nature Reserve. The current [Management Plan \(2016 - 2026\)](#) contains a number of management measures. In particular, management of the saltmarsh and other wetland habitats through grazing and the creation and management of pools (wader scrapes) is a priority and is aimed at benefiting a number of the SPA features.
- WWT (Caerlaverock) and RSPB (Mersehead, Crook of Baldoon, Campfield Marsh) own and manage reserves with a focus on delivering benefits for many of the features of the SPA.
- Solway Barnacle Goose Management Scheme: Prior to winter 2021/22 the wintering population of Svalbard Barnacle Geese had increased (from less than 5,000 birds in the 1960s to over 40,000 in recent years⁶) with consequential increased conflict with agriculture as a result of crop damage. The Solway Barnacle Goose Management Scheme⁷ is therefore in place to manage this on the Scottish side of the Firth. Roosts and the core feeding area in the reserves are protected, with farmland in key usage areas zoned to provide undisturbed feeding refuge areas of swards attractive to geese, reduced disturbance in buffer zones and scaring permitted in areas less favoured by geese. Compensation is paid to farmers for crop losses. Scaring is generally non-lethal, although a very limited number of licences have been issued in recent years to shoot geese where there was no satisfactory alternative (bags

⁶ <https://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/species-accounts/svalbard-barnacle-geese/>

⁷ <https://www.nature.scot/professional-advice/land-and-sea-management/managing-wildlife/managing-geese/solway-barnacle-geese-management-scheme>

assessed against the most recent population viability analysis for this population (Trinder, 2014)).

- The Solway Estuary Partnership works to reduce disturbance on the estuary and has produced educational information and codes of conduct for estuary users.
- Wildfowling takes place along the foreshore within the Solway Firth SPA between August to February, depending on the species. Wildfowling is regulated through byelaws at Caerlaverock National Nature Reserve (NNR) on the inner Solway and within the Wigtown Bay Local Nature Reserve (LNR). At Caerlaverock NNR the shooting season runs from October to end of February.
- Current shoreline management plans for both Cumbria and Dumfries and Galloway dissuade non-essential development and defence of currently undeveloped shoreline. Working closely with Dumfries & Galloway Council, NatureScot encourages within the Dumfries & Galloway Shoreline Management Plan that it includes examination of the potential effects and requirements to deal with rising sea levels, and impacts of harmful storm events upon the coastline, taking full account of the diversity of protected areas and species associated with the D&G Coastline.
- The inshore Fishing (Prohibition of Fishing for Cockles)(Solway Firth) (Scotland) Order 2011 (SSI 2011/319) currently prohibits fishing of cockles by any means within the Solway Firth SAC and SPA in Scottish waters. Total Allowable Catches (TAC) have been managed through cockle stock assessment and modelling of the prey requirements for key protected bird species of the SPA to ensure appropriate levels of cockle prey are maintained.
- The North Western Inshore Fisheries and Conservation Authority (NWIFCA) manages fisheries on the English side of the Solway Firth. Cockle and mussel fisheries remain closed under byelaw unless there are sufficient cockles or mussels above the minimum landing size to support a fishery, as assessed by the NWIFCA.

7.2 Advice to support management

Table 2 provides NatureScot's and Natural England's advice on management for activities where we consider this may be necessary to achieve the Conservation Objectives for the protected features. The advice is focused on the activities that cause an effect (a pressure) that a feature is sensitive to. Pressures can be physical (e.g. abrasion of the seabed), chemical (e.g. introduction of pollutants) or biological (e.g. removal of prey resources). Different activities may cause the same pressure, e.g. fishing using bottom gears and aggregate dredging both cause abrasion which can damage the surface of the seabed.

Our advice takes a risk-based approach, i.e. we are focusing on providing advice where we believe there is a risk to achieving the Conservation Objectives. We have identified risks to achieving the Conservation Objectives where there is an overlap between protected features and activities associated with pressures that the features are sensitive to. We have provided management advice to support public authorities and others in managing these risks. Our advice is based on existing data and information on protected features and relevant activities, and our understanding of the relationships between the features and activities. We have identified a range of management advice:

- management to remove or avoid pressures;
- management to reduce or limit pressures; or
- no additional management required.

For our advice on fisheries management we have also stated where we think this should be 'considered.' This term is included to highlight that an issue exists, but circumstances mean that a specific recommendation for action cannot / or need not be made at this point. However, there is sufficient cause to make fishery managers aware of the issue and

for them to consider if a fishery management measure may be helpful in achieving Conservation Objectives – particularly where there may be a synergy between the benefits of management actions for the fishery and the Conservation Objectives for the feature. The term ‘recommended’ highlights that an issue of fishery-feature interaction exists, there is a reasonable evidence base and a specific recommendation can be made/ justified.

New or other activities not identified within the table would need to be considered on a case-by-case basis. We recognise that stakeholders can provide local environmental knowledge and more detailed information on activities, including in relation to intensity, frequency and methods. This additional information will help public authorities and others develop more specific management, focussed on the interaction between features and activities. If new information becomes available our management advice may be revised.

Table 2 describes the activities that are considered capable of affecting the protected features. Spatial data relating to the location and extent of the activities listed can be accessed on [Marine Scotland’s National Marine Plan Interactive](#) or the [Marine Management Organisation Marine Information System](#) (where available). Activities that are considered not likely to affect the protected features are listed in Table 3.

7.3 Best Practice

In our management advice for activities in Table 2 we refer to the development, adoption or use of ‘best practice’ as a way of managing interactions between activities and the features. Best practice is taken to mean approaches or procedures that are developed and accepted by regulators and relevant stakeholders as being an effective way of dealing with an interaction between a habitat or species and the pressures created by an activity. Much of this best practice is already being implemented by sectors and regulators, e.g. pre-application discussions between developers and regulators, the Scottish Marine Wildlife Watching Code, the WiSe scheme, The Green Blue Project green boating guides, the Countryside Code, the Scottish Outdoor Access Code, and Technical Standards for Scottish Finfish Aquaculture.

Table 2a and 2b. NatureScot and Natural England’s advice to support management for Solway Firth SPA for activities which are considered capable of affecting the protected features.

The text under the ‘Advice to support management’ columns provides our management advice for the features in relation to the activities (further details about the terminology used are provided in section 7.2) that are considered capable of affecting the protected features. Where a cell is coloured grey this indicates that management is already in place, this includes where there are existing regulatory requirements for new proposals. Cells are also coloured grey where it is considered there is no additional management required to achieve the Conservation Objectives. An * has been used to highlight those activities to which the advice under ‘*Boat use associated with both commercial and recreational activities*’ also applies. For some activities, the pressures associated with new proposals are considered unlikely to affect some the features either because these activities do not occur in the same locations as the features or the pressure is unlikely to be at levels that can affect the features (see also Table 3). In these cases, we have not provided advice however, where regulated; this does not exempt new plans or projects related to these activities undergoing a Habitats Regulations Appraisal/Assessment (HRA).

Table 2a. Advice on red-throated diver, seaducks, goosander, cormorant and gulls.

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
Aquaculture - shellfish*	<p>No additional management required for existing shellfish farms provided management of entanglement pressures at shellfish farms within the SPA follow current and evolving best practice with respect to net mesh sizes and tensioning and use of anti-predator nets.</p> <p>Reduce or limit pressures (entanglement, disturbance, reduction of prey supporting habitat) associated with proposed new shellfish farms, consented inactive, or expansion of existing farms. Appropriate mitigation may include:</p> <ul style="list-style-type: none"> • Seasonal limitation and/or defining routes for maintenance vessels, in particular to avoid important foraging areas for the protected features (as identified from habitat and dive depth preferences). • Spatial limitation to avoid damaging or restricting access to prey-supporting habitats of the protected features. • Careful siting of new shellfish farms. 			
Boat use associated with both commercial and recreational activities.	<p>Reduce or limit pressures (disturbance) associated with new boat use during commercial and recreational activities through effective mitigation such as:</p> <ul style="list-style-type: none"> • following the Scottish Marine Wildlife Watching Code (SMWWC). • seasonal and/or spatial restrictions to avoid sensitive time periods for those protected features most susceptible to disturbance and/or; 			

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
	<ul style="list-style-type: none"> production of vessel management plans associated with activities that require a marine licence. This may include agreed routes and for boats, potential seasonal speed restrictions. 			
Cables and pipelines*	<p>No additional management for existing cables and pipelines.</p> <p>Reduce or limit pressures (disturbance, loss or damage to prey-supporting habitat) associated with new cable laying activities, within or adjacent to the SPA.</p>	<p>No additional management for existing cables and pipelines.</p> <p>Reduce or limit pressures (disturbance, loss or damage to prey-supporting habitat) associated with new cable laying activities, within or adjacent to the SPA.</p>	<p><i>Pressures unlikely to affect these features.</i></p>	
Coastal development - (coastal protection and flood defence)	<p>No additional management for existing coastal protection and flood defences.</p> <p>Reduce or limit pressures (disturbance, loss of prey-supporting habitat) associated with new coastal development through effective seasonal and temporal mitigation.</p>		<p>Reduce or limit pressures (displacement) associated with new coastal development of buildings, in particular for breeding herring gull.</p> <p>Reduce or limit pressures (disturbance, loss of prey-supporting habitat) associated with new coastal development through effective seasonal and temporal mitigation.</p>	
Commercial shipping* (includes	<p>No additional management for existing commercial shipping in established routes (e.g. Workington, Whitehaven, Silloth, Maryport and Kirkcudbright).</p>			

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
ferries, cargo, tanker vehicles)	Reduce or limit pressures (disturbance) for new routes or amendments to existing routes within the context of cumulative effects of all boat activity.			
Dredging/ extraction of material* (inc. maintenance dredging and capital dredging)	<p>No additional management for existing maintenance dredging (ports and harbours).</p> <p>Reduce or limit pressures (disturbance, damage of supporting habitat) associated with new capital dredging projects and associated maintenance dredging through appropriate mitigation such as:</p> <ul style="list-style-type: none"> • spatial limitations to avoid damaging supporting habitat within foraging dive ranges of protected features and/or; • seasonal restrictions. 			
Fishing - demersal mobile/active gear (inc. mechanical trawls and benthic trawls)*	<p>Whilst we have limited understanding about the extent of interactions between benthic fisheries and prey supporting habitat within the site, we recommend that a principal objective of the management of the relevant fisheries should be to ensure that the fishing activity does not cause such disturbance to the benthic habitats that it adversely affects the abundance and availability of prey.</p> <p>Reduce or limit pressures (removal of prey species and abrasion of prey-</p>	<p>Whilst we have limited understanding about the extent of interactions between benthic fisheries and prey supporting habitat, we recommend that a principal objective of the management of the relevant fisheries should be to ensure that the fishing activity does not cause such damage to the benthic habitats that it adversely affects the availability of prey to bottom-feeding seaducks.</p> <p>The prey of seaducks are benthic species (particularly molluscs but also other</p>	<p>Whilst we have limited understanding about the extent of interactions between benthic fisheries and prey supporting habitat within the site, we recommend that a principal objective of the management of the relevant fisheries should be to ensure that the fishing activity does not cause such disturbance to the benthic habitats that it adversely affects the abundance and availability of prey.</p> <p>Reduce or limit pressures (removal of prey species and abrasion of prey-</p>	<p>Whilst we have limited understanding about the extent of interactions between benthic fisheries and prey supporting habitat, we recommend that a principal objective of the management of the relevant fisheries should be to ensure that the fishing activity does not cause such damage to the benthic habitats that it adversely affects the availability of prey to gull species (either directly or indirectly).</p>

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
	supporting habitat) associated with fishing that has the potential to damage seabed habitat (in particular, sandeel habitat).	marine invertebrates) which are associated with habitats within the site. Consideration of site-based management to avoid adverse impact on prey availability may be appropriate.	supporting habitat) associated with fishing that has the potential to damage seabed habitat (in particular, sandeel habitat).	
Fishing – hydraulic dredge*	<p>Hydraulic dredging has the potential to cause significant disturbance to the sediment habitats that support the prey species of the protected features, particularly for sandeel. We recommend that a principal objective of the management of the relevant fisheries should be to ensure that the fishing activity does not cause such disturbance to the benthic habitats that it adversely affects the abundance and availability of prey.</p> <p>Remove or avoid pressures (removal of prey species and disturbance of</p>	<p>Hydraulic dredging has the potential to cause significant disturbance to the sediment habitats that support the prey species of the protected features. We recommend that a principal objective of the management of the relevant fisheries should be to ensure that the fishing activity does not cause such disturbance to the benthic habitats that it adversely affects the abundance and availability of prey of bottom-feeding seaducks.</p> <p>Remove or avoid pressures (removal of prey species and disturbance of prey-supporting habitat)</p>	<p>Hydraulic dredging has the potential to cause significant disturbance to the sediment habitats that support the prey species of the protected features, particularly for sandeel. We recommend that a principal objective of the management of the relevant fisheries should be to ensure that the fishing activity does not cause such disturbance to the benthic habitats that it adversely affects the abundance and availability of prey.</p> <p>Remove or avoid pressures (removal of prey</p>	<p>Hydraulic dredging has the potential to cause significant disturbance to the sediment habitats that support the prey species of the protected features. We recommend that a principal objective of the management of the relevant fisheries should be to ensure that the fishing activity does not cause such disturbance to the benthic habitats that it adversely affects the abundance and availability of prey.</p> <p>Remove or avoid pressures (removal of prey</p>

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
	prey-supporting habitat) associated with hydraulic fishing that has the potential to damage seabed habitat (in particular, sandeel habitat).	associated with hydraulic fishing that has the potential to damage seabed habitat.	species and disturbance of prey-supporting habitat) associated with hydraulic fishing that has the potential to damage seabed habitat (in particular, sandeel habitat).	species and disturbance of prey-supporting habitat) associated with hydraulic fishing that has the potential to damage seabed habitat.
Fishing – static gear	Remove or avoid pressures (entanglement) associated with the use of all static nets. Spatial exclusion of static nets in areas identified as being important for red-throated diver (as identified from habitat and dive depth preferences) between mid-September and May is recommended.	Remove or avoid pressures (entanglement) associated with the use of all static nets. Spatial exclusion of static nets in areas identified as being important for seaduck (as identified from habitat and dive depth preferences) between August and May is recommended.	Remove or avoid pressures (entanglement) associated with the use of all static nets. Spatial exclusion of static nets in areas identified as being important for goosander and cormorant (as identified from habitat and dive depth preferences) is recommended.	<i>Pressures unlikely to affect these features.</i>
Fishing - recreational	No additional management for existing recreational fishing providing the Scottish Marine Wildlife Watching Code (SMWWC), the Scottish Outdoor Access Code, and the Countryside Code are followed by recreational users. Further management may be required to manage recreational pressure consistently across the site.		Reduce or limit pressures (disturbance, accidental bycatch, loss of prey) should there be evidence of impacts at particular locations or there is an increase in intensity of these pursuits within the SPA. Further management may be required to manage	<i>Pressures unlikely to affect these features.</i>

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
			recreational pressure consistency across the site. Reduce or limit pressures (mortality) associated with licensed control – <i>existing management in place.</i>	
Fishing – hand gathering of mussels and oysters	<i>Pressures unlikely to affect this feature.</i>	No additional management for hand gathering of mussels and oysters – <i>existing management in place under byelaws.</i>		
Fishing – pelagic*	<p>Remove or avoid pressures (removal of key prey species) associated with fishing for sandeels. There is no current targeted sandeel fishery within the SPA, this position should be retained.</p> <p>Pelagic fishing for herring/sprat may occur within or around the SPA. We recommend that a principal objective of the management of the fishery should be ensuring that the fishing activity does not prevent or disrupt the availability of prey species</p>	<i>Pressure unlikely to affect these features.</i>	<p>Remove or avoid pressures (removal of key prey species) associated with fishing for sandeels. There is no current targeted sandeel fishery within the SPA, this position should be retained.</p> <p>Pelagic fishing for herring/sprat may occur within or around the SPA. We recommend that a principal objective of the management of the fishery should be ensuring that the fishing activity does not prevent or disrupt the availability of prey species</p>	<p><i>For herring gull -</i> Remove or avoid pressures (removal of key prey species) associated with fishing for sandeels. There is no current targeted sandeel fishery within the SPA, this position should be retained.</p> <p>Pelagic fishing for herring/sprat may occur within or around the SPA. We recommend that a principal objective of the management of the fishery should be ensuring that the fishing activity does not prevent or disrupt the</p>

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
	for divers i.e. it should be considered as part of a broader ecosystem-based approach to management of this fishery.		for goosander or cormorant, i.e. it should be considered as part of a broader ecosystem-based approach to management of this fishery.	availability of prey species for herring gull i.e. it should be considered as part of a broader ecosystem-based approach to management of this fishery. <i>For black-headed gull and common gull – pressures unlikely to affect these features.</i>
Ports and harbours	<p>No additional management for existing operations at ports and harbours within the Solway Firth SPA.</p> <p>Reduce or limit pressures (disturbance, displacement, loss or damage to prey-supporting habitat) associated with new development proposals or expansion of existing ports and harbours within or adjacent to the SPA. Appropriate mitigation may include:</p> <ul style="list-style-type: none"> • spatial limitations to avoid damaging supporting habitat within foraging dive range of the protected features and/or; • seasonal restrictions during construction to avoid periods when birds are present. 		<p><i>For cormorant:</i> Reduce or limit pressures (disturbance, displacement, loss of roosting habitat) associated with new development proposals or expansion of existing ports and harbours within or adjacent to the SPA. Appropriate mitigation may include:</p> <ul style="list-style-type: none"> • spatial limitations to avoid damaging roosting habitat and/or; • seasonal restrictions during construction to avoid periods 	<p><i>Pressures unlikely to affect these features.</i></p>

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
			when birds are present. and/or; <ul style="list-style-type: none"> • providing or securing key roost areas for cormorants. 	
Renewable energy – offshore wind and tidal	<p>No additional management required for the Robin Rigg wind farm.</p> <p>Remove or avoid pressures (collision mortality and displacement) associated with new wind or tidal lagoon proposals until such time as research and monitoring provide further information on this potential impact pathway in this area.</p> <p>Reduce or limit pressures (loss of foraging habitat, loss of prey species, change in estuarine dynamics) associated with new tidal lagoons proposals.</p>			
Seaweed harvesting	<p>No additional management for existing seaweed harvesting activities for hand-harvesting.</p> <p>Reduce or limit pressures associated with new seaweed hand-harvesting developments.</p> <p>Remove or avoid pressures associated with mechanical harvesting.</p>			
Tourism & recreation (inc. walkers, personal water crafts, kite surfing, paddle boarding, yachting, diving, kayaking)	<p>No additional management for existing recreational activities (includes walking, yachting, diving, paddle boarding, kayaking) providing the Scottish Marine Wildlife Watching Code (SMWWC), the Scottish Outdoor Access Code and the Countryside Code is followed by recreational users.</p> <p>Reduce or limit pressures (disturbance) associated with personal water crafts and kite surfing.</p> <p>Reduce or limit pressures (disturbance) where an increase by recreational activities demonstrates there is</p>		<p>No additional management for existing recreational activities (includes yachting, diving, kayaking) providing the Scottish Marine Wildlife Watching Code (SMWWC), the Scottish Outdoor Access Code and the Countryside Code is followed by recreational users.</p>	<p>No additional management for existing recreational activities (includes walking, yachting, diving, kayaking) providing the Scottish Marine Wildlife Watching Code (SMWWC), the Scottish Outdoor Access Code and the Countryside Code is followed by recreational users.</p>

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
	<p>evidence of impacts at particular locations and/or if there is a major increase in intensity of these pursuits within the SPA. There would be potential for some zonation of measures across the site given that some protected features exhibit behavioural sensitivity to disturbance.</p> <p>Further management may be required to manage recreational pressure consistently across the site.</p>		<p>Reduce or limit pressures (disturbance) associated with personal water crafts, kite surfing.</p> <p>Reduce or limit pressures (disturbance) associated and land-based recreation, particularly in areas with known cormorant and goosander roosts.</p> <p>Reduce or limit pressures (disturbance) where an increase by recreational activities demonstrates there is evidence of impacts at particular locations and/or if there is a major increase in intensity of these pursuits within the SPA. There would be potential for some zonation of measures across the site.</p> <p>Further management may be required to manage recreational pressure consistently across the site.</p>	<p>Reduce or limit pressures (disturbance) associated with personal water crafts and kite surfing.</p> <p>Reduce or limit pressures (disturbance) where an increase by water-borne recreational activities demonstrates there is evidence of impacts at particular locations and/or if there is a major increase in intensity of these pursuits within the SPA. There would be potential for some zonation of measures across the site.</p>

Activities considered capable of affecting the protected features	Advice to support management			
	Red-throated diver	Common scoter, greater scaup, common goldeneye	Goosander and cormorant	Herring gull, black-headed gull, common gull
Wildfowling	<i>Pressure unlikely to affect this feature</i>	<p><i>For common scoter and scaup</i> Reduce or limit pressures (disturbance) associated with wildfowling.</p> <p><i>For goldeneye</i> Reduce or limit pressures (quarry mortality and disturbance) associated with wildfowling – <i>existing management in place within Caerlaverock NNR and Wigtown Bay Local Nature Reserve (LNR).</i></p>	Reduce or limit pressures (disturbance) associated with wildfowling.	Reduce or limit pressures (disturbance) associated with wildfowling.
Wildlife tour operators*	<p>No additional management for existing wildlife tours providing the Scottish Marine Wildlife Watching Code is followed by Wildlife tour operators. The Scottish Marine Wildlife Watching Code (SMWWC), the Scottish Access Code and the Countryside Code should be followed by recreational users.</p> <p>Reduce or limit pressures (disturbance) associated with an increase in wildlife tour operators if in the future there is evidence of impacts at particular locations and/or if there is an increase in intensity of these pursuits within the SPA. There would be potential for some zonation of measures across the site given that some protected features exhibit behavioural sensitivity to disturbance.</p>			

Table 2b: Advice on whooper swan, barnacle geese, pink-footed geese, shelduck, pintail, teal, shoveler and wader species.

Activities considered capable of affecting the protected features	Advice to support management		
	Whooper swan, barnacle geese, pink-footed geese	Shelduck, pintail, teal and shoveler	Waders (golden plover, bar-tailed godwit, oystercatcher, knot, ringed plover, grey plover, lapwing, dunlin, sanderling, redshank, turnstone, curlew).
Aquaculture - shellfish*	<i>Pressures unlikely to affect these features.</i>	<i>Pressures unlikely to affect these features.</i>	Reduce or limit pressures (disturbance) associated with proposed new shellfish farms, consented inactive, or expansion of existing farms, in relation to any aquaculture activities taking place in the inter-tidal areas.
Cables and pipelines*	<p>No additional management for existing cables and pipelines powerlines.</p> <p>Reduce or limit pressures (disturbance, loss or damage to prey-supporting habitat) associated with new construction works on inter-tidal areas through effective seasonal and temporal mitigation.</p>	<p>No additional management for existing cables and pipelines.</p> <p>Reduce or limit pressures (disturbance, loss or damage to prey-supporting habitat) associated with new construction works on inter-tidal and sub-tidal areas through effective seasonal and temporal mitigation.</p>	<p>No additional management for existing cables and pipelines powerlines.</p> <p>Reduce or limit pressures associated (disturbance, loss or damage to prey-supporting habitat) with new construction works on inter-tidal areas and areas above the high tide line through effective seasonal and temporal mitigation.</p>
Development - (including coastal protection, coastal flood defence, urban and industrial expansion)	<p>No additional management for existing coastal protection and flood defences.</p> <p>Reduce or limit pressures (disturbance) associated with construction of new coastal development through effective seasonal and temporal mitigation.</p>	<p>No additional management for existing coastal protection and flood defences.</p> <p>Reduce or limit pressures (disturbance) associated with construction of new coastal development through effective seasonal and temporal mitigation.</p>	<p>No additional management for existing coastal protection and flood defences.</p> <p>Reduce or limit pressures (disturbance) associated with construction of new coastal development through effective seasonal and temporal mitigation.</p>

Activities considered capable of affecting the protected features	Advice to support management		
	Whooper swan, barnacle geese, pink-footed geese	Shelduck, pintail, teal and shoveler	Waders (golden plover, bar-tailed godwit, oystercatcher, knot, ringed plover, grey plover, lapwing, dunlin, sanderling, redshank, turnstone, curlew).
	Reduce or limit pressures (displacement and permanent loss of habitat) associated with new coastal development through careful siting of any developments.	Reduce or limit pressures (displacement and permanent loss of habitat) associated with new coastal development through careful siting of any developments.	Reduce or limit pressures (displacement and permanent loss of habitat) associated with new coastal development through careful siting of any developments.
Discharges – industrial, agricultural and sewage	Reduce or limit pressures (loss of habitat and prey) associated with discharges, particularly where this can cause loss of feeding habitat (for example of saltmarsh) and prey, e.g. through algal blooms.	Reduce or limit pressures (loss of habitat and prey) associated with discharges, particularly where this can cause loss of feeding habitat and prey, e.g. through algal blooms.	Reduce or limit pressures (loss of habitat and prey) associated with discharges, particularly where this can cause loss of feeding habitat (for example of saltmarsh) and prey, e.g. through algal blooms.
Fishing – hand gathering of shellfish	<i>Pressures unlikely to affect these features.</i>	<i>Pressures unlikely to affect these features.</i>	No additional management for hand gathering of mussels and oysters – existing management in place under byelaws.
Fishing – intertidal (bait digging)	<i>Pressures unlikely to affect these features.</i>	<i>Pressures unlikely to affect these features.</i>	Reduce or limit pressures (disturbance, displacement and loss of prey) associated with intertidal bait gathering of shellfish, including crab tiling.
Farming	Reduce or limit pressures (displacement and loss of foraging habitat) associated with changes in agricultural land outwith the SPA,	Reduce or limit pressures (displacement and loss of foraging habitat) associated with changes in agricultural land outwith the SPA, used by ducks as feeding areas.	Reduce or limit pressures (displacement and loss of habitat) associated with changes in agricultural land outwith the SPA.

Activities considered capable of affecting the protected features	Advice to support management		
	Whooper swan, barnacle geese, pink-footed geese	Shelduck, pintail, teal and shoveler	Waders (golden plover, bar-tailed godwit, oystercatcher, knot, ringed plover, grey plover, lapwing, dunlin, sanderling, redshank, turnstone, curlew).
	used by geese and swans as feeding areas.		
Forestry	<p>No additional management for existing forestry on non-peat bog sites.</p> <p>Remove or avoid pressures (prevention of foraging habitat establishment) associated with restocking of existing forestry on peat bog sites.</p> <p>Reduce or limit pressures (displacement and loss of foraging habitat) associated with new forestry proposals outwith the SPA, adjacent to geese and swan feeding areas (notably around Caerlaverock, Mersehead and Wigtown Bay).</p>	<p>No additional management for existing forestry.</p> <p>Reduce or limit pressures (displacement and loss of foraging habitat) associated with new forestry proposals outwith the SPA, adjacent to duck feeding areas.</p>	<i>Pressures unlikely to affect these features.</i>
Grazing	Reduce or limit pressures (loss of foraging habitat) associated with grazing regimes. Appropriate levels of stock grazing should be identified and implemented to benefit habitat condition for geese and swans that use the saltmarsh habitat.	Reduce or limit pressures (loss of foraging habitat) associated with grazing regimes. Appropriate levels of stock grazing should be identified and implemented to benefit habitat condition for those ducks that use saltmarsh habitat.	Reduce or limit pressures (loss of foraging habitat) associated with grazing regimes. Appropriate levels of stock grazing should be identified and implemented to benefit habitat condition for those waders that rely on saltmarsh habitat.

Activities considered capable of affecting the protected features	Advice to support management		
	Whooper swan, barnacle geese, pink-footed geese	Shelduck, pintail, teal and shoveler	Waders (golden plover, bar-tailed godwit, oystercatcher, knot, ringed plover, grey plover, lapwing, dunlin, sanderling, redshank, turnstone, curlew).
Infrastructure - powerlines	Reduce or limit pressures (mortality) associated with powerlines along commuting routes between foraging and roosting areas within and outwith the Solway Firth SPA, for swans and geese.	<i>Pressures unlikely to affect these features.</i>	<i>Pressures unlikely to affect these features.</i>
Ports and harbours	No additional management for existing operations at ports and harbours within the Solway Firth SPA. Reduce or limit pressures (disturbance, displacement, loss or damage to prey supporting habitats) associated with new development proposals or expansion of ports and harbours within or adjacent to the SPA.		
Renewables (onshore wind, solar, tidal, offshore wind)	Reduce or limit pressures (collision mortality) associated with any new proposed onshore wind farms. Reduce or limit pressures (disturbance, displacement, changes to or loss of foraging habitat) associated with any onshore structures associated with new proposed onshore renewable energy developments (including onshore wind or solar power developments).	Reduce or limit pressures (disturbance, displacement, loss of prey-supporting habitat) associated with any onshore structures associated with new proposed renewable energy developments.	Reduce or limit pressures (disturbance, displacement, changes to or loss of prey-supporting habitat) associated with any onshore structures associated with new proposed renewable energy developments (including onshore wind or solar power developments).

Activities considered capable of affecting the protected features	Advice to support management		
	Whooper swan, barnacle geese, pink-footed geese	Shelduck, pintail, teal and shoveler	Waders (golden plover, bar-tailed godwit, oystercatcher, knot, ringed plover, grey plover, lapwing, dunlin, sanderling, redshank, turnstone, curlew).
	Reduce or limit pressures (collision, barrier effects, displacement) associated with any new offshore renewable energy developments (may include offshore wind or tidal).		
Seaweed harvesting	<p>No additional management is recommended for existing seaweed harvesting activities for hand-harvesting.</p> <p>Reduce or limit pressures (disturbance) associated with new seaweed harvesting developments.</p> <p>Remove or avoid pressures (disturbance, removal of prey supporting habitat) associated with mechanical harvesting of seaweed (in particular, of kelp).</p>		
Tourism & recreation (inc. walkers, horse riding, swimming, kayaking, personal water crafts, paddle boarding, kite surfing)	<p>No additional management for existing recreational activities (including walkers, horse riding, swimming, kayaking, paddle boarding) providing the Scottish Outdoor Access Code (SOAC), Countryside is followed by recreational users.</p> <p>Reduce or limit pressures (disturbance) associated with personal water crafts and kite surfing.</p> <p>Reduce or limit pressures (disturbance) associated with any proposed new walking trails, through careful routing and buffer zones were necessary.</p> <p>Reduce or limit pressures (disturbance) where an increase by recreational activities demonstrates there is evidence of impacts at particular locations and/or if there is a major increase in intensity of these pursuits within the SPA. There would be potential for some zonation of measures across the site given that some protected features exhibit behavioural sensitivity to disturbance.</p> <p>Further management may be required to manage recreational pressure consistently across the site.</p>		

Activities considered capable of affecting the protected features	Advice to support management		
	Whooper swan, barnacle geese, pink-footed geese	Shelduck, pintail, teal and shoveler	Waders (golden plover, bar-tailed godwit, oystercatcher, knot, ringed plover, grey plover, lapwing, dunlin, sanderling, redshank, turnstone, curlew).
Wildfowling	<p><i>For whooper swan and barnacle goose</i> Reduce or limit pressures (disturbance) associated with wildfowling.</p> <p><i>For pink-footed goose</i> Reduce or limit pressures (quarry mortality and disturbance) associated with wildfowling <i>existing management in place within Caerlaverock NNR and Wigtown Bay Local Nature Reserve (LNR).</i></p>	<p><i>For shelduck</i> Reduce or limit pressures (disturbance) associated with wildfowling.</p> <p><i>For teal, pintail and shoveler</i> Reduce or limit pressures (quarry mortality and disturbance) associated with wildfowling <i>existing management in place within Caerlaverock NNR and Wigtown Bay Local Nature Reserve (LNR).</i></p>	<p><i>For golden plover within the SPA (excluding Caerlaverock NNR)</i> Reduce or limit pressures (mortality) associated with wildfowling.</p> <p><i>For golden plover within Caerlaverock NNR</i> Remove or avoid pressures (mortality) associated with wildfowling – existing management in place on the Caerlaverock NNR only - <i>shooting is not permitted for this species</i></p> <p><i>For all other wader species</i> Reduce or limit pressures (disturbance) associated with wildfowling.</p>
Wildlife tour operators*	<p>No additional management for existing wildlife tours providing the Scottish Marine Wildlife Watching Code is followed by Wildlife tour operators. The Scottish Marine Wildlife Watching Code (SMWWC), the Scottish Access Code and the Countryside Code should be followed by recreational users.</p> <p>Reduce or limit pressures (disturbance) associated with an increase in wildlife tour operators if in the future there is evidence of impacts at particular locations and/or if there is an increase in intensity of these pursuits within the SPA. There would be potential for some zonation of measures across the site given that some protected features exhibit behavioural sensitivity to disturbance.</p>		

Table 3. Activities that are considered not likely to affect the protected features (other than insignificantly) ⁸

Activity	Comments
Anchorage & moorings	Beyond pressures associated with the vessel movement (covered above under the relevant activities), we are not aware of any further pressures that have the potential to cause an adverse effect on the qualifying features.
Fishing – static gear – Creels (including lobster, crabs, whelks and <i>Nephrops</i>)	Fishing using creels is likely to be widespread in the outer waters of the site. Whilst there is the potential for some mortality through entanglement for some species such as divers, the occurrence is rare and therefore we consider this method poses a low risk to the qualifying species. Pressures associated with the vessel traffic from this pressure is covered under Table 2.
Fishing – mobile gear – line fishing (includes long-lining and jigging)	Pelagic long-line fishing is largely restricted to offshore waters and therefore at present are thought to pose a low risk to the qualifying species. Pressures associated with the vessel traffic from this pressure is covered under Table 2.

⁸ Only the specific examples of activities listed in the table have been excluded, rather than the broad activity types. New plans or projects will still need to be considered by the relevant competent authority (see Annex 1 for further details).

8 Research and survey requirements

We recognise that there are still important gaps in our understanding and knowledge of the features of this site. We will identify research and survey projects to inform our understanding of these aspects. The knowledge gaps identified below are not a commitment to undertake this work. However, by highlighting these gaps we hope to inform future discussions with parties interested in undertaking research in this site and/or on these features, to help direct research and improve understanding of monitoring needs. The following list of research and survey needs is not prioritised and is not exhaustive.

- Baseline information on supporting habitats and key prey species for all protected features, to improve understanding of locally important prey species. In addition, an understanding of what the bird food requirements are of different prey species.
- Better understanding of why some protected features are in unfavourable condition at the site.
- Mapping changes in saltmarsh (a key habitat for geese and some wader protected features) distribution and extent at Solway Firth SPA as a result of increased storm event frequency, intensity and sea level rise associated with climate change is required.
- Additional data on the distribution of the protected features, notably waders, in relation to habitats which, due to the dynamic nature of the site, are subject to changes would be of value in predicting future population and supporting habitat distribution.
- Mapped distribution of high tide roosts of the relevant protected features for the Solway coast, which is of particular importance for the wader protected features.
- Additional information on use of the site for moulting seaducks, in particular by scaup and common scoter.
- Research is required on understanding the level of connectivity and linkages of cormorants and goosanders to river systems feeding into the Solway Firth SPA, particularly those rivers which are subject to licensed control.
- Research is required on the potential impact of wildfowling at the Solway Firth SPA, particularly in relation to those protected features which are quarry species in addition to being in unfavourable condition.
- Research is required on understanding the connectivity between the Solway Firth SPA and inland sites used by gull species.
- Better understanding of the relationships between the impact of dredging and benthic trawling on supporting habitats.
- Studies on the origin of the wintering populations of the protected features, in particular data is lacking on red-throated divers.
- Understanding required on the impacts of static gear fishery activity stake and poke nets on wader distribution, avoidance, and potential incidental trapping.
- Knowledge required on the turnover of the wintering populations of the protected features and the relationships with other protected areas, to ensure the wider network of sites functions effectively for the protected features.
- Studies of the energetic/survival consequences of red-throated diver's behavioural sensitivity to visual disturbance, including within the Solway Firth SPA;
- Studies on the recreational impacts on the site from key activities and locations is required to inform decisions with regards tourism and associated infrastructure development.
- Better understanding on the implications of new onshore developments around the site on the protected features.
- Updated winter gull survey is required nationally, including at the Solway Firth SPA.

- Consideration required of developing population targets for wintering gull species at Solway Firth SPA.
- A dedicated, appropriate survey is required for goosander and cormorant protected features.
- Investigation is required to assess the impact of avian flu on the waterfowl species at the Solway Firth SPA, in particular for the goose species.
- Ensure suitable monitoring of the protected features at the Solway Firth SPA is in place, as part of a national programme of marine birds monitoring to assess population trends and changes in distribution. In addition, noting that some species are missed by standard WeBS methodologies and thus may require other survey methodologies.

Annex 1. Solway Firth SPA Conservation Objectives

The box below provides the high-level Conservation Objective statements for the Solway Firth SPA.

The full Conservation Objectives, which includes site-specific advice and information on the qualifying features that form part of this SPA, are provided in the tables that follow. The site-specific advice and information provides more detail in relation to each of the high level Conservation Objective statements for each feature, e.g. detail on the seasonal timings and what the supporting habitats and prey are for the qualifying features.

Information is also provided below on how minor changes to features should be considered and the influence of environmental change on features, particular in relation to climate change. Temporary impacts on the qualifying features resulting from plans or projects can only be permitted where there is certainty that the features will be able to quickly recover. Further details on the potential for each qualifying feature to recover are described in more detail in Annex 2 'Factors determining the potential of features to recover'.

A definition of the terms used is in the Glossary (Annex 3).

The * denotes a named qualifier of the water bird assemblage.

Solway Firth SPA

Qualifying features:

- Red-throated diver (*Gavia stellata*)
- Whooper swan (*Cygnus cygnus*)
- Barnacle goose (*Branta leucopsis*)
- Golden plover (*Pluvialis apricaria*)
- Bar-tailed godwit (*Limosa lapponica*)
- Pink footed goose (*Anser brachyrhynchus*)
- Common shelduck (*Tadorna tadorna*)*
- Common teal (*Anas crecca*)*
- Northern pintail (*Anas acuta*)
- Northern shoveler (*Anas clypeata*)*
- Greater scaup (*Aythya marila*)
- Common scoter (*Melanitta nigra*)*
- Common goldeneye (*Bucephala clangula*)*
- Goosander (*Mergus merganser*)*
- Eurasian oystercatcher (*Haematopus ostralegus*)
- Red knot (*Calidris canutus*)
- Ringed plover (*Charadrius hiaticula*)
- Grey plover (*Pluvialis squatarola*)*
- Northern lapwing (*Vanellus vanellus*)*
- Dunlin (*Calidris alpina*)*
- Sanderling (*Calidris alba*)*
- Common redshank (*Tringa totanus*)
- Ruddy turnstone (*Arenaria interpres*)*
- Eurasian curlew (*Numenius arquata*)
- Great cormorant (*Phalacrocorax carbo*)*
- Black-headed gull (*Larus ridibundus*)*
- Common gull (*Larus canus*)*

- Herring gull (*Larus argentatus*)*

The Solway Firth SPA also supports:

- Waterfowl assemblage, non-breeding

1. To ensure that the qualifying features of the Solway Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

2. To ensure that the integrity of the Solway Firth SPA is maintained or restored as appropriate, in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:

2a. The populations of the qualifying features are viable components of the site.

2b. The distributions of the qualifying features throughout the site are maintained, or where appropriate, restored by avoiding significant disturbance of the species.

2c. The supporting habitats and processes relevant to the qualifying features and their prey/food resources are maintained or where appropriate, restored.

1. To ensure that the qualifying features of the Solway Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

Achieving FCS is defined in terms of the natural range and population of the species and the extent of habitat necessary for long-term maintenance of populations. There is an important role for all protected sites in the UK in defining, achieving and maintaining FCS for any habitat or species. Achieving FCS requires that each parameter is either stable or increasing, exceeds the relevant reference value and has good prospects of continuing to do so in the foreseeable future (JNCC, 2018). Favourable Conservation Status (FCS) is assessed across the Marine Atlantic Biogeographic Region with individual SPAs and SPA networks contributing to FCS.

The conservation status will be taken as 'favourable' when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future;
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis;

When carrying out appraisals of plans and projects against these Conservation Objectives, it is not necessary to understand the status of the qualifying features within each individual SPA in this Biogeographic Region. The focus of the appraisal should be to understand whether the integrity of the Solway Firth SPA would be maintained. If this is the case, then its contribution to FCS across the qualifying features' biogeographic range will be met. Similarly, when determining whether management measures may be required to ensure that the Conservation Objectives for this SPA are achieved, the focus should be on maintaining the contribution that it makes to FCS. Further advice on how these appraisals should be focussed in relation to maintaining site integrity is provided by Conservation Objective 2 (including parts a, b and c). If broader information (status, trends) on the qualifying features is available, it should be used to provide context to the site-based appraisal.

Note '*Appropriate*' within this part of the Conservation Objectives is included to indicate that the contribution to FCS varies from site to site, and feature to feature.

2. To ensure that the integrity of Solway Firth SPA is maintained or restored as appropriate, in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:

This objective recognises that bar-tailed godwit, scaup, lapwing, grey plover, knot, curlew, turnstone and goldeneye, are in unfavourable condition at the Solway Firth SPA and consequently site integrity is compromised.

For the Solway Firth SPA, when carrying out appraisals of plans or projects, the focus of the appraisal should be to understand the impact of the plan or project on site integrity. For qualifying features that are favourable condition this means maintaining that condition. For those

qualifying features that are in unfavourable condition, it means ensuring that the plan or project does not prevent or reduce the potential for recovery. The expectation is not for the plan or project to restore site integrity. Should the plan or project compromise the ability of the qualifying features to recover (e.g. result in a further decline or accelerate the rate of decline, or prevent a recovery from occurring), then the Solway Firth SPA will not make an appropriate contribution to achieving FCS across the Atlantic Biogeographic Region. Similarly, when determining whether management measures are required to meet the Conservation Objectives, the focus is on ensuring the conditions are appropriate to support recovery and subsequently restore site integrity. Further advice on how these appraisals should be focussed in relation to site integrity is provided in 2a, b and c.

The non-breeding waterfowl assemblage is not considered further in the Conservation Objectives as each qualifying feature and 'named qualifier' of the assemblage are addressed individually.

Temporary impacts on these objectives resulting from plans or projects can only be permitted where there is a high degree of certainty that the features will be able to quickly recover from the impact and that impacts do not prevent the ability of unfavourable features to fully recover in the long-term.

Environmental changes

These Conservation Objectives recognise that the qualifying features are part of a complex, dynamic and multi-dimensional environment. Marine and terrestrial birds depend on environmental conditions (for example water movement, up-wellings and prevailing weather) which vary over time and space. Consequently, the qualifying features are exposed to a wide range of drivers of change. 'Environmental changes' for the purpose of these Conservation Objectives means any change to the qualifying features reflecting both natural population dynamics and also broader environmental changes (i.e. those related to climate change and environmental variability, management of which is beyond the scope of the SPA). The impact of human activities on the SPA that can be managed will not be considered as part of the broader context of environmental change (i.e. where required they should be managed).

Some site-level changes are natural and are not a direct result of human influences (e.g. population fluctuations arising from factors such as variable breeding success or weather conditions across the wintering range / shifts or changes in prey availability resulting from variability in environmental factors processes such as water temperature and movements). Changes in the qualifying features' distribution and use of the site, which are brought about by entirely natural drivers, directly or indirectly, are normally considered compatible with the SPA's Conservation Objectives.

There may also be historical human influences that have now ceased but have modified and continue to drive change within the site. It is also recognised that climate change pressures could affect the qualifying features within the site. These changes cannot be prevented, so the Conservation Objectives seek at a site level to take account of them and where possible, improve the qualifying species' resilience to

environmental change when considering future plans or projects. The magnitude of the future impacts will depend on the nature, scale, duration and intensity of the activity and the qualifying features tolerance and ability to recover from such an impact.

Additionally, management of human activities at a wider scale (i.e. regional, Scotland, England, or the area covered by an international agreement such as the OSPAR Convention or the AEWa treaty) may also affect the qualifying features associated with this site (either by making a positive contribution or having a negative impact). Wider scale impacts may affect the ability of the qualifying features to recover from site level changes, and therefore additional precaution over the impacts of any future human activities may be necessary.

An assessment of whether a change is natural or anthropogenic, or a combination of both, will need to be looked at on a case-by-case basis.

In relation to the Solway Firth SPA and its qualifying features, the following effects of environmental change (climate change) are relevant. These effects should be taken into account when considering plans and projects as additional pressures may reduce the qualifying features' resilience to climate change, and conversely climate change impacts may start to hinder their ability to recover from human activities.

- **All qualifying features** - Under climate change, sea temperatures are predicted to increase, sea levels will rise and there could be increases in the frequency of stormy conditions. Any of these factors could cause changes in bird abundance and distribution at the SPA due to changes in prey (species, availability and distribution), both in marine waters and in intertidal areas. The Solway Firth SPA contains large areas of important inter-tidal habitats which many of the qualifying features use. Relative sea level rises at Solway Firth SPA are occurring, which could affect the extent, composition, distribution, quality and species diversity in these intertidal areas, including habitats such as saltmarsh. It is also possible that climate change may result in effects at their breeding grounds or in other parts of the overall wintering range which could have subsequent effects on their wintering populations and distributions.
- **Red-throated diver:** Long-term population variations in breeding populations of red-throated divers have been identified as corresponding with a large scale climatic pattern but the mechanism for any causal link has not been established (Schmutz, 2014). It is unclear what effects climate change might have on non-breeding red-throated divers.
- **Whooper swan, barnacle geese, pink-footed geese:** There is some evidence for climate change affecting these species (e.g. Stirnemann *et al.* 2012; Prop *et al.* 2015; Clausen *et al.* 2018; Jensen *et al.* 2018; Lameris *et al.* 2018; Tombre *et al.* 2019; Fjellidal *et al.* 2020), with potential effects on migration and breeding timings, distribution and interactions with other species, although future impacts are unknown.
- **Wader species:** Wintering waders in the UK have shifted their distribution eastward since the mid-1980s, with a shift in mean winter temperature (Boere & Stroud, 2006). Effects of climate change have been noted for some species (e.g. grey plover, curlew, turnstone), commonly through effects on their prey resource during their breeding period. Wader species are particularly sensitive to changes in coastal environments as a result of climate change (Maclean *et al.* 2008; Rehfish & Austin, 2006). Several wader species are also known to be vulnerable to cold winter temperature and other severe weather conditions, which can impact on adult survival.

- **Duck species:** Several duck species (e.g. pintail, shoveler) have responded to increasing winter temperatures by advancing their spring migration dates (Guillemain *et al.* 2013). Shifts in wintering ranges in ducks have also been recorded and attributed to climate change (e.g. common goldeneye has seen significant north-easterly shifts in their wintering range over the past three decades (Lehikoinen *et al.* 2013).
- **Cormorant and goosander:** Temperature increases have been attributed to cormorants expanding their range into previously colder climates. Cormorants are susceptible to die offs in particularly cold winters (Russell *et al.* 2015; Marion & Bergerot, 2018). Whilst some studies have shown goosander populations to be stable since the 1990s (Marchowski *et al.* 2017), others have demonstrated that at the flyway range their distributions have shifted as a response to changes in temperature (Lehikoinen *et al.* 2013).
- **Gulls (herring, common, black-headed gull):** The potential impacts of climate change on non-breeding gulls in the UK are unclear.

2a. The populations of qualifying features are viable components of the site.

This objective seeks to specifically protect the qualifying features from **significant** mortality, injury or removal that can lead to a long-term decline of the feature(s) within the site. It protects the features from significant risk of incidental killing and injury from activities both within and outwith the site. Impacts and effects are considered 'significant' where they could result in a permanent or long-term reduction or continued decline in the population and consequently, reduction in the contribution the Solway Firth SPA makes to the maintenance of the qualifying features in their natural range in the UK. It should be ensured that the qualifying features are protected from anthropogenic pressures that could lead to a significant long-term decline in numbers using the site. Ensuring the capacity of the Solway Firth SPA to support all the essential behaviours and activities required to support viable populations of the qualifying features are addressed by Conservation Objectives 2b and 2c.

At a site level, all qualifying features are considered to be viable if the species can carry out their life cycle functions relevant to the season(s) they are present, irrespective of dependencies such as immigration. In the Solway Firth SPA, this means that overwinter survival should not significantly decrease for non-breeding birds and birds that have overwintered on this site should have good enough body condition to be able to migrate to their breeding grounds and breed successfully.

When assessing the effects of any plan or project consideration should also be given to whether impacts outwith the SPA could affect achievement of this Conservation Objective. This Conservation Objective is considered to be met if the conditions to support all the species' essential behaviours and activities are in place. This includes:

- avoiding effects within and outwith the site that could prevent or reduce the ability of the populations of qualifying features to recover.
- avoiding effects within and outwith the site that could lead to a permanent reduction in the populations of qualifying features through mortality, injury, or impacts caused by disturbance, displacement, barrier effects, including during migration, or reduction in mobile prey resources.
- maintaining the species' ability to use all areas of importance within the site (to be considered under Conservation Objective 2b)

- maintaining access to, and availability of, supporting habitats and prey within the site (to be considered under Conservation Objective 2c).

Where known, the populations of the qualifying features should be maintained at or above site reference populations, as detailed below. The site reference population may be revised from the baseline at designation where a) there is evidence to show that a population's size has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period (generally equivalent to at least one generation length for the given species) and/or b) to reflect any wider strategic objectives for the species (e.g. national or international species action plan). Where there is evidence to show that a qualifying feature has historically been more abundant than the stated minimum target and current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account.

All qualifying features are protected throughout the whole site, throughout the year. This means that irrespective of the season for which they are designated, the qualifying features are protected during both their breeding and non-breeding seasons when using the SPA.

Temporary short-term changes in the populations due to human activity may be considered not to compromise the Conservation Objectives within the site provided it can be demonstrated that the populations of any affected qualifying features can fully recover. Factors limiting the recovery of the qualifying features include: the average generation times, population growth rates, availability of prey and the timing and duration of the activity around vulnerable stages of their life cycles such as during moulting or chick-rearing period.

Direct mortality can arise from: collision (above and underwater); entanglement (incidental bycatch); wildfowling, disease, and pollution. Indirect mortality can arise from reduction of prey or prey-supporting habitats (e.g. through harvesting; physical removal of or damage to seabed; nutrient enrichment; changes to water temperature, salinity, or flows; introduction of invasive non-native species (INNS); pollution). Indirect mortality can arise from reduced ability to capture or access prey arising from e.g. increased water turbidity or displacement from foraging areas.

For all waterfowl qualifying features (except barnacle goose): the site-specific information includes a site reference population that is considered the most appropriate for assessments of plans and projects. Where this is based on the citation population at classification or recent surveys, the site reference population is rounded using standard procedures (Stroud *et al.* 2001). The GB population estimates are taken from Musgrove *et al.* 2013 and UK trend information from Frost *et al.* 2018, unless otherwise stated.

For Svalbard barnacle goose: an amended baseline-population is considered the most appropriate site reference population for assessments of plans and projects. This amended baseline is based on agreement on a Favourable Reference Value (FRV) for Svalbard barnacle goose within the African-Eurasian Migratory Waterbird Agreement (AEWA) (AEWA, 2020).

For wintering gulls (herring, black-headed and common gulls): data for site selection was derived from a winter gull roost survey. This data was a minimum estimate of numbers and is not appropriate for use as a site reference population.		
Feature	Site-specific advice	Site-specific information
Red-throated diver	Maintain the population of non-breeding red-throated diver at a stable or increasing trend relative to the site reference population.	The site reference population for red-throated divers at the Solway Firth SPA is 530 individuals (5 year mean of peak 2001/02-2005/06), representing approximately 3.1% of the GB non-breeding population (for the period 2004/05-2008/09). Red-throated divers in the non-breeding period have decreased across the UK by 27% (2005/06-2016/17). Trend information for this species at this site is not available.
Common scoter	Maintain the population of non-breeding common scoter at a stable or increasing trend relative to the site reference population.	The site reference population for common scoters at the Solway Firth SPA is 1600 individuals (5 year mean of peak 2001/02-2005/06), around 1.6% of the GB wintering population (for the period 2004/05-2008/09). Common scoter numbers have increased in the UK overall since 1980, with their population estimated to have increased by over 155% (2005/06-2016/17). However, this trend may reflect better contemporary survey coverage, in particular through aerial surveys covering waters further from the shore.
Goosander	Maintain the population of non-breeding goosander at a stable or increasing trend relative to the site reference population. and Ensure goosander can move safely between the site and important areas of functionally linked land and freshwater bodies outwith the site.	The site reference population for goosanders at the Solway Firth SPA is 150 individuals (5 year mean of peak 2007/08-2011/12), approximately 1.2% of the GB wintering population (for the period 2004/05-2008/09). From 1980-2010 goosanders have increased in numbers UK-wide, though the shorter-term trend is defined as being stable (-8% decrease between 1999-2010) (Holt <i>et al.</i> 2012). Trend information for this species at this site is not available. Goosander from the Solway Firth SPA will use functionally linked land and freshwater environments outwith the SPA during the non-breeding season for roosting, and will also use areas of freshwater habitats in the breeding and non-breeding seasons. Observations on the Cumbria coast, for example, have shown some will forage in the estuary but return to coastal freshwater bodies and river mouths to roost and preen. Some freshwater sites used by goosander that feed into/are adjacent to the Solway Firth include: River Nith, Border Esk, N&D Fishing, Annan, River Annan, Loch Kindar, River Cree, Eden and Derwent. This species population is subject to annual licensed control at these freshwater bodies.

		When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.
Great cormorant	<p>Maintain the population of non-breeding cormorant at a stable or increasing trend relative to the site reference population.</p> <p>and</p> <p>Ensure cormorant can move safely between the site and important areas of functionally linked land and freshwater bodies outwith the site.</p>	<p>The site reference population for cormorants at the Solway Firth SPA is 580 individuals (mean of peak estimate 2007/08-2011/12), representing 2% of the GB wintering population. The UK trend overall shows that the cormorant population has increased by 133% between 1987/88-2016/17. However, in Scotland trends are not as clear: increases occurred from late 1980s to early 1990s, but this has since been followed by a period of decline until the present day (Humphreys <i>et al.</i> 2016). There is an amber WeBS alert for cormorant at Solway Estuary, meaning there has been a decline between 25-50% of the population, due to a decline in their long-term, medium-term and short-term population at the site.</p> <p>Cormorants from the Solway Firth SPA will use functionally linked land and freshwater environments outwith the SPA during the non-breeding season for roosting, and may also use areas of freshwater habitats in the breeding season. Some freshwater sites used by cormorants that feed into/are adjacent to Solway Firth include: River Nith, Border Esk, N&D Fishing, Annan, River Annan, Loch Kindar, River Cree, Eden and Derwent. This species population is subject to annual licensed control at these freshwater bodies.</p> <p>When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.</p>
Whooper swan	<p>Maintain the population of non-breeding whooper swan at a stable or increasing trend relative to the site reference population.</p> <p>and</p> <p>Ensure whooper swans can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>The site reference population for whooper swans at the Solway Firth SPA is 250 individuals (5 year mean of peak 1986/87 - 1990/91), representing 4% of the GB overwintering population. The Solway Estuary had the largest concentration of whooper swans in Scotland (382 birds) in the 2015 international census (Hall <i>et al.</i> 2016). The mean of peak between 2015-2019 was 279 individuals from WeBS counts, demonstrating the population has remained largely stable since designation. At a UK-scale wintering whooper swans have increased by around 490% between 1980/81-2016/17.</p> <p>Whooper swans from the Solway Firth SPA will use functionally linked land outwith the SPA during the non-breeding season for foraging. Surrounding agricultural fields</p>

		with stubbles and grass are traditionally used by the wintering population of swans as important foraging areas. Around the south side of the Solway seems to be important in particular. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.
Pink-footed goose	<p>Maintain the population of non-breeding pink-footed goose at a stable trend relative to the site reference population.</p> <p>and</p> <p>Ensure pink-footed geese can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>The site reference population for pink-footed geese at the Solway Firth SPA is 14,900 individuals (5 year mean of peak 1986 to 1991), representing 14% of the GB overwintering population. Recent counts combining WeBS with specific goose counts suggests the pink-footed goose population has remained largely stable since designation. The UK-wide trend shows that wintering pink-footed geese have increased by 400% between 1980/81-2016/17. Regular goose counts take place for pink-footed geese as part of the Goose and Swan Monitoring Programme (Brides <i>et al.</i> 2019). In winter of 2021/22 the pink-footed goose population declined at Solway Firth SPA due to avian flu. However, it is not yet known how this may impact the population at the site in future years.</p> <p>The population of wintering pink-footed geese on the Solway is subject to variations due to movements within and between winters, resulting from changes in winter temperatures, short-term severe weather events and short and medium term changes in preferred feeding locations elsewhere in the UK. This includes a significant shift to new feeding and wintering locations in north west England and East Anglia as these opportunities have arisen. Possible reduced cold weather movements and recent mild winters may be a continuing factor in the wintering population levels on the Solway Firth.</p> <p>Pink-footed geese from the Solway Firth SPA will use functionally linked land outwith the SPA during the non-breeding season for foraging on surrounding agricultural land. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.</p>
Common shelduck	Maintain the population of non-breeding shelduck at a stable or increasing trend relative to the site reference population.	The site reference population for shelduck at the Solway Firth SPA is 1600 individuals (5 year mean of peak 1986-1991), representing 2% of the UK wintering population. The most recent WeBS counts (average 2015-2019) for Solway Firth shows that shelduck numbers have increased slightly from the baseline citation population. Local breeding birds are augmented by winter immigration from Europe

		<p>and southern Scandinavia. The UK trend shows that the long-term trend for shelduck is stable between 1980/81-2016/17, with the short-term trend showing a 14% decrease between 2005/06-2016/17.</p> <p>There is an amber WeBS alert for shelduck at Solway Estuary, meaning there has been a decline between 25-50% of the population, due to a decline in their medium-term population at the site.</p>
Common teal	Maintain the population of non-breeding teal at a stable or increasing trend relative to the site reference population.	The site reference population for teal at the Solway Firth SPA is 1400 individuals (5 year mean of peak 1986-1991), representing 1% of the GB overwintering population. The latest 5 year mean for Solway Firth from WeBS counts indicate that teal have increased in numbers since designation to around 3400. The UK trend shows teal have increased by around 96% between 1980/81-2016/17, with their short-term trend showing their numbers have stabled between 2005/06-2016/17.
Northern pintail	<p>Maintain the population of non-breeding pintail at a stable or increasing trend relative to the site reference population.</p> <p>and</p> <p>Ensure pintail can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>The site reference population for pintail at the Solway Firth SPA is 1400 individuals (5 year mean of peak 1986-1991), representing 6% of the GB overwintering population. This has since increased to an average peak of around 3000 individuals (2015-2019). Numbers of pintail can fluctuate considerably, between and within years due in part to weather conditions and availability of inland feeding and roosting. The UK trend shows pintail have decreased by 19% in their long-term trend (1980/81-2016/17), and short-term trend (-34% between 2005/06-2016/17).</p> <p>Pintail from the Solway Firth SPA will use functionally linked land outwith the SPA during the non-breeding season for foraging on stubbles in the surrounding agricultural land. Areas of stubble are generally exploited in late summer and early autumn and pintail are therefore routinely present in similar areas between years. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.</p>
Northern shoveler	<p>Maintain the population of non-breeding shoveler at a stable or increasing trend relative to the site reference population.</p> <p>and</p>	The site reference population for shovelers at the Solway Firth SPA 120 individuals (5 year mean of peak 1986-1991), in excess of 1% of the GB population. The most recent WeBS counts (average 2015-2019) for Solway Firth shows that shelduck numbers have remained stable around 200. The UK trend shows shoveler have increased by around 138% between 1980/81-2016/17.

	<p>Ensure shoveler can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>Shovelers from the Solway Firth SPA will use functionally linked land outwith the SPA during the non-breeding season for foraging on stubbles in the surrounding agricultural land, particularly during the autumn. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.</p>
Greater scaup	<p>Ensure the population of non-breeding scaup has the ability to recover to the site reference population.</p> <p>and</p> <p>Ensure non-breeding scaup are not at significant risk from injury or mortality.</p>	<p>The site reference population for scaups at the Solway Firth SPA is around 2300 individuals (5 year mean of peak 1986-1991), representing 57% of the GB overwintering population. The most recent assessment show that scaup numbers have decreased by 77% from the baseline citation population, with an average peak of 535 individuals (2015-2019). Scaup numbers across the UK increased by 15% between 1980/81-2016/17 however their short-term trend (2005/06-2016/17) shows a large decline of around 52%.</p> <p>The reasons for the decline in scaup at the Solway Firth SPA are uncertain. A WeBS red alert (meaning there has been more than 50% decrease in population) has been issued for scaup at Solway Estuary.</p>
Eurasian oystercatcher	<p>Maintain the population of non-breeding oystercatcher at a stable or increasing trend relative to the site reference population.</p> <p>and</p> <p>Ensure oystercatchers can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>The site reference population for oystercatchers at the Solway Firth SPA is 34,000 birds (5 year mean of peak 1986-1991), representing 12% of the GB population. The most recent assessment show that oystercatcher numbers have decreased by 21% from the baseline citation population, with an average peak of around 26,600 individuals (2015-2019). The UK-wide trend shows that oystercatcher numbers have remained relatively stable (around 5% decrease) both in their long-term (1980/81-2016/17) and short-term (2005/06-2016/17) trends. Significant population turnover is thought to occur during the non-breeding period and cold weather movements from east coast estuaries can augment populations.</p> <p>There is an amber WeBS alert for oystercatchers at Solway Estuary, meaning there has been a decline between 25-50% of the population, due to a decline in their long-term population at the site. The reasons for the decline in oystercatchers in the Solway Firth region are uncertain.</p> <p>Oystercatchers from the Solway Firth SPA are likely to use surrounding agricultural land outwith the SPA during the non-breeding season as functionally linked land for foraging, particularly when birds may have difficulty finding food at low tide. When</p>

		<p>assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.</p>
Northern lapwing	<p>Ensure the population of non-breeding lapwing has the ability to recover to the site reference population.</p> <p>and</p> <p>Ensure non-breeding lapwing are not at significant risk from injury or mortality.</p> <p>and</p> <p>Ensure lapwing can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>The site reference population for lapwings at the Solway Firth SPA is 5,000 lapwing (5 years mean of peak 2007/08-2011/12), representing 1% of the GB wintering population. WeBS counts between 2015-2019 for Solway Firth indicate that lapwing numbers have decreased by 51% since original designation (1991-1996 baseline). The UK-wide trend shows that lapwing numbers have increased overall in their long-term trend by around 223% between 1980/81-2016/17, though their short-term trend shows a 23% decline (2005/06-2016/17). A WeBS red alert (meaning there has been more than 50% decrease in population) has been issued for lapwing at Solway Estuary.</p> <p>Lapwing are mobile species which migrate on a daily basis between feeding grounds and roost sites. Adjacent fields (outwith the Solway Firth SPA), are used by lapwing for important wintering foraging. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective. Maintaining safe connectivity between these sites is important to ensure utilisation of the most optimal habitats.</p> <p>The reasons for the decline in lapwing at Solway Firth SPA are uncertain but may relate to disturbance due to recreation or changes in the food supply outwith the site. Pressures in their breeding season outwith the SPA may also be having a subsequent effect on their wintering populations.</p>
Golden plover	<p>Maintain the population of non-breeding golden plover at a stable or increasing trend relative to the site reference population.</p> <p>and</p> <p>Ensure golden plovers can move safely between the site and</p>	<p>The site reference population for golden plovers at the Solway Firth SPA is 3400 individuals (5 year mean of peak 1986/87 - 1990/91), representing 2% of GB wintering population. The most recent assessment show that golden plover numbers have increased from the baseline citation population, with an average peak of around 5400 individuals (2015-2019). The UK-wide trend shows that golden plover numbers have increased overall in their long-term trend by around 355% between 1980/81-2016/17, though their short-term trend shows a 36% decline (2005/06-2016/17).</p> <p>Golden plovers from the Solway Firth SPA are likely to use surrounding agricultural land outwith the SPA during the non-breeding season as functionally linked land for</p>

	important areas of functionally linked land outwith the site.	foraging or roosting. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.
Grey plover	<p>Ensure the population of non-breeding grey plover has the ability to recover to the site reference population.</p> <p>and</p> <p>Ensure non-breeding grey plover are not at significant risk from injury or mortality.</p> <p>and</p> <p>Ensure grey plover can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>The site reference population for grey plovers at the Solway Firth SPA is 720 individuals (5 year mean of peak 1986 to 1991), representing 3% GB population. The most recent assessment show that grey plover numbers have decreased by 59% from the baseline citation population, with an average peak of 292 individuals (2015-2019). The UK-wide trend shows that grey plover numbers have increased overall in their long-term trend by around 56% between 1980/81-2016/17, with their short-term trend showing their population has stabilised (2005/06-2016/17).</p> <p>The reasons for the decline in grey plover at the Solway Firth SPA are uncertain. Due to the difference in decline at the site compared to the UK wide trends, it suggests that site-specific pressures may be contributing to the decline at this site. A WeBS red alert (meaning there has been more than 50% decrease in population) has been issued for grey plover at the Solway Estuary.</p> <p>Grey plovers may use adjacent fields (outwith the Solway Firth SPA), for winter foraging and roosting. Roosting occurs often in association with larger flocks of golden plover and lapwing. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective. Maintaining safe connectivity between these sites is important to ensure utilisation of the most optimal habitats.</p>
Ringed plover	Maintain the passage and wintering population of ringed plover at a stable or increasing trend relative to the site reference population.	The site reference population for ringed plovers at the Solway Firth SPA on spring and autumn passage is 980 birds (5 year mean of peak 2007/08-2011/12), representing 1.3% of the biogeographic population. WeBS counts between 2015-2019 for Solway Firth indicate that ringed plover numbers have remained stable since designation, being around 960. The UK-wide trend shows that ringed plover numbers have decreased overall in their long (1980/81-2016/17) and short-term (2005/06-2016/17) trends by around 30%.
Red knot	Ensure the population of non-breeding knot has the ability to recover to the site reference population.	The site reference population for knots at the Solway Firth SPA is 15,300 individuals (5 year mean of peak 1986 to 1991), representing 7% of the GB wintering population, making them one of the most abundant species of the site. The most recent assessment show that knot numbers have decreased by 59% from the baseline

	<p>and</p> <p>Ensure non-breeding knot are not at significant risk from injury or mortality.</p>	<p>citation population, with an average peak of around 6300 individuals (2015-2019). The UK-wide trend shows that knot numbers have increased slightly in their long-term trend by around 14% between 1980/81-2016/17, with their short-term trend showing their population has stabilised (2005/06-2016/17). A WeBS red alert (meaning there has been more than 50% decrease in population) has been issued for knot at Solway Estuary.</p> <p>The reasons for the decline in knot at the Solway Firth SPA are uncertain. The fact that their trend is decreasing at the site, whereas the population across the UK has increased suggests there may be site-specific issues that need considered. It may be related to site-specific issues with mussel and cockle prey items, which are known to be low at the site, and are important for knot to maintain their body condition. Knot are also known to be highly sensitive to disturbance.</p>
Dunlin	Maintain the population of non-breeding dunlin at a stable or increasing trend relative to the site reference population.	The site reference population for dunlins at the Solway Firth SPA is 11,900 individuals (5 year mean of peak 1986 to 1991), representing 3% GB wintering population. The most recent assessment show that dunlin numbers have increased from the baseline citation population, with an average peak of around 17,400 individuals (2015-2019). The UK-wide trend shows that dunlin numbers have remained stable overall in their long-term trend 1980/81-2016/17, though their short-term trend shows their population has declined by around 32% in recent years (2005/06-2016/17).
Sanderling	Maintain the population of non-breeding sanderling at a stable or increasing trend relative to the site reference population.	The site reference population for sanderlings at the Solway Firth SPA is around 260 individuals (5 year mean of peak 1986 to 1991), representing 2% GB population. The non-breeding population has increased in recent years in the overlapping Upper Solway Flats and Marshes SSSI to 384 birds (2010/11-2014/15). The latest WeBS average (2015-2019) shows sanderling numbers within the Solway Firth has since increased to around 450 individuals. The UK-wide trend shows that sanderling numbers have increased overall in their long-term trend by around 64% between 1980/81-2016/17, with their short-term trend also showing a population increase of 15% (2005/06-2016/17).
Common redshank	Maintain the population of non-breeding redshank at a stable or increasing trend relative to the site reference population.	The site reference population for redshanks at the Solway Firth SPA is 2100 individuals (5 year mean of peak 1986 to 1991), representing 3% of the GB wintering population. The most recent assessment show that redshank numbers have increased from the baseline citation population to around 2800 (2015-2019). The UK-wide trend shows that redshank numbers have remained relatively stable (around 9%

		decrease) in their long-term (1980/81-2016/17), but have shown a short-term (2005/06-2016/17) decline of 13%.
Ruddy turnstone	<p>Ensure the population of non-breeding turnstone has the ability to recover to the site reference population.</p> <p>and</p> <p>Ensure non-breeding turnstone are not at significant risk from injury or mortality.</p>	<p>The site reference population for turnstones at the Solway Firth SPA is 600 (5 year mean of peak 1986 to 1991), representing 1% of GB wintering population. The latest WeBS counts (2015-2019) for Solway Firth suggest around a 63% decrease in turnstone numbers to around 220. The UK-wide trend shows that turnstone numbers have remained relatively stable (around 3% increase) in their long-term trend (1980/81-2016/17), but have shown a short-term (2005/06-2016/17) decline of around 20%.</p> <p>The reasons for the decline in turnstone at Solway Firth SPA are uncertain.</p>
Eurasian curlew	<p>Ensure the population of non-breeding curlew has the ability to recover to the site reference population.</p> <p>and</p> <p>Ensure non-breeding curlew are not at significant risk from injury or mortality.</p>	<p>The site reference population for curlews at the Solway Firth SPA is 6700 individuals (5 year mean of peak 1986 to 1991), representing 7% of the GB wintering population. Numbers of curlew have been decreasing on the site with the latest assessed condition showing a 67% decline since baseline (average peak of 2183 between 2015-2019). The UK-wide trend shows that curlew numbers have increased by around 21% in their long-term trend (1980/81-2016/17), but have shown a short-term (2005/06-2016/17) decline of 17%.</p> <p>The reasons for the decline in curlew at the Solway Firth SPA are uncertain, although may relate to a wider-scale decline nationally. Curlews are known to be prone to disturbance. A WeBS red alert (meaning there has been more than 50% decrease in population) has been issued for curlew at Solway Estuary.</p>
Common goldeneye	<p>Ensure the population of non-breeding goldeneye has the ability to recover to the site reference population.</p> <p>and</p> <p>Ensure non-breeding goldeneye are not at significant risk from injury or mortality.</p>	<p>The site reference population for goldeneyes at the Solway Firth SPA is 300 individuals (5 year mean of peak 1986 to 1991) representing around 2% of the UK non-wintering non-wintering population. The most recent assessment show that goldeneye numbers have decreased dramatically by 82% from the baseline citation population, with an average peak of 54 individuals (2015-2019). Goldeneye numbers in the UK have decreased by over 8% between 1980-2017, with the short-term trend showing a decrease of around 36% (2005/06-2016/17). Numbers are swelled during severe cold weather if inland waterbodies are frozen and unavailable as feeding areas.</p>

		<p>The reasons for the decline in goldeneye at the Solway Firth SPA are uncertain but seem to reflect a larger-scale decline, possibly relating to improvements in inshore water quality. A WeBS red alert (meaning there has been more than 50% decrease in population) has been issued for goldeneye at the Solway Estuary.</p>
Bar-tailed godwit	<p>Ensure the population of non-breeding bar-tailed godwit has the ability to recover to the site reference population.</p> <p>and</p> <p>Ensure non-breeding bar-tailed godwit are not at significant risk from injury or mortality.</p>	<p>The site reference population for bar-tailed godwits at the Solway Firth SPA is 4800 individuals (5 year mean of peak 1986/87 - 1990/91) representing 8% of the GB wintering population. Numbers of bar-tailed godwits have been steeply decreasing on the site with the latest assessed condition showing a 91% decline since baseline (average peak of 425 between 2015-2019). The UK-wide trend shows that bar-tailed godwit numbers have remained relatively stable in their long-term (10% decrease) (1980/81-2016/17), and short-term (8% increase) (2005/06-2016/17) trends.</p> <p>The reasons for the decline in bar-tailed godwits at the Solway Firth SPA are uncertain but may reflect a larger-scale decline. At the Solway Firth SPA this species is known to be very prone to disturbance. A WeBS high alert (meaning there has been more than 50% decrease in population) has been issued for bar-tailed godwit at Solway Estuary.</p>
Barnacle goose	<p>Maintain the population of non-breeding Barnacle goose (Svalbard population) at a stable or increasing trend relative to the site reference population.</p> <p>and</p> <p>Ensure barnacle geese can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>The site reference population for barnacle geese at the Solway Firth SPA is 25,000 individuals, representing close to 100% of the GB wintering population for Svalbard barnacle goose (Black, 1998; Jensen <i>et al.</i> 2018). The barnacle goose population has increased at the site from its original citation population of 12,300 with the non-breeding population now estimated at 41,300 individuals (5 year mean 2013/14-2017/18, WWT data). This reflects a UK-wide recovery in wintering numbers over the period 1980/81-2016/17 by more than 350% for this subspecies. However, in winter of 2021/22 the barnacle goose population had a decline of about a third of the population due to avian flu. It is not yet known how this may impact the population at the site in future years, nor whether this event is likely to become more frequent in years to come.</p> <p>Barnacle geese are mobile species which migrate on a daily basis between feeding grounds and roost sites. Barnacle geese from the Solway Firth SPA will use functionally linked agricultural land outwith the SPA during the non-breeding season for foraging (e.g. see Griffin, 2019 for some locations used outwith the SPA). When assessing the effects of any plan or project consideration should therefore also be</p>

		given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.
Black-headed gull	<p>Ensure the population of non-breeding black-headed gulls are not at significant risk from injury or mortality.</p> <p>and</p> <p>Ensure black-headed gulls can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>There is currently no trend information available for non-breeding black-headed gull populations at the Solway Firth SPA. The latest winter gull survey recorded a minimum of 14,000 non-breeding black-headed gulls in Solway Firth (Banks <i>et al.</i> 2007).</p> <p>Within and adjacent to the Solway Firth SPA black-headed gulls are likely to use coastal and inter-tidal foraging areas, as well as inland sites such as fields and ponds outwith the SPA for foraging. The level of interchange between feeding areas within and outwith the SPA, and the roosting areas they use within the Solway Firth SPA however is not fully understood. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.</p> <p>No site-reference population is set for black-headed gulls at the Solway Firth SPA.</p>
Common gull	<p>Ensure the population of non-breeding common gulls are not at significant risk from injury or mortality.</p> <p>and</p> <p>Ensure common gull can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>There is currently no trend information available for non-breeding common gull populations at the Solway Firth SPA. The latest winter gull survey recorded a minimum of 12,000 non-breeding common gulls in Solway Firth (Banks <i>et al.</i> 2007).</p> <p>Common gulls will forage in intertidal and coastal habitats adjacent to and within the Solway Firth SPA and are likely to be attracted to washed-up seaweed, feeding on sandhoppers and the larvae and adults of shore flies (Vernon, 1972). Within the terrestrial and freshwater environments they may use agricultural land or ponds, foraging on other prey items such as agricultural grain, earthworms, insects and carrion. The level of interchange between feeding areas within and outwith the SPA, and the roosting areas they use within the Solway Firth SPA however is not fully understood. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.</p>
Herring gull	<p>Ensure the population of non-breeding herring gulls are not at significant risk from injury or mortality.</p>	<p>There is currently no trend information available for non-breeding herring gull populations at the Solway Firth SPA. The latest winter gull roost survey recorded a minimum of 3000 non-breeding herring gulls in the Solway Firth (Banks <i>et al.</i> 2007). Herring gulls have experienced a 56% decline in their breeding populations within the</p>

	<p>and</p> <p>Ensure herring gulls can move safely between the site and important areas of functionally linked land outwith the site.</p>	<p>UK (1986-2019), and 60% below the baseline in Scotland (1986-2019) (JNCC, 2021). No trend information is currently available for their non-breeding populations at a UK scale.</p> <p>A number of breeding colonies occur around the entire coastline of the site and these may form part of the wintering population, augmented by birds from Iceland and Scandinavia.</p> <p>Herring gulls using the Solway Firth SPA for roosting will also use terrestrial environments outwith the SPA in both breeding and non-breeding periods. These may include agricultural/pastoral fields, intertidal habitats, freshwater habitats, and urbanised/more built-up areas. When assessing the effects of any plan or project consideration should therefore also be given to whether impacts on the population whilst outwith the SPA could affect achievement of this Conservation Objective.</p> <p>No site-reference population is set for non-breeding herring gull at the Solway Firth SPA because the level of interchange between the roosting areas used within the SPA and feeding areas used within and outwith the SPA, is not fully understood.</p>
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2b. The distribution of the qualifying features throughout the site is maintained or where appropriate, restored by avoiding significant disturbance of the species.

This objective seeks to ensure that the qualifying features can continue to use and access all areas within the Solway Firth SPA used for feeding, moulting, roosting, loafing, shelter and other maintenance activities. This objective also recognises that the populations of bar-tailed godwit, scaup, lapwing, grey plover, knot, curlew, goldeneye, and turnstone at the Solway Firth SPA are in unfavourable condition and that this may, in part, be due to disturbance at the site. Changes in the distribution of the qualifying features are most likely to be brought about through disturbance, therefore this objective relates to avoiding significant disturbance. Changes in distribution may also result from shifts in prey distributions; this is considered under objective 2c. Disturbance associated with human activity may take a variety of forms including: noise, light, sound, vibration, trampling, presence of people, animals and structures, as well as displacement and barrier effects on the species. The type of disturbance, its duration and the area over which the qualifying features are likely to be affected are important considerations in any appraisal of disturbance.

Disturbance can, for example, result in changes to feeding or roosting behaviour, increased energy expenditure due to increased time spent moving to avoid stressors, abandonment of roost sites and desertion of supporting habitat (both within or outside the protected area where appropriate). This may affect the subsequent breeding season (related to poor winter condition of adult birds), feeding and/or roosting, and/or may reduce the availability of suitable habitat as birds are displaced and their distribution within the site contracts.

'Significant disturbance' should be interpreted to mean disturbance that affects the integrity of the site through alteration of the distribution of the qualifying features such that recovery cannot be expected or effects can be considered long term. It is expected that significant disturbance will lead to more than a transient effect on the distribution of the qualifying features. It may result in the following types of effect:

- Contributes to the long-term decline in the use of the site by the qualifying features.
- Changes to the distribution of the qualifying features on a continuing or sustained basis.
- Changes to the qualifying features behaviour such that it reduces the ability of the species to survive, breed or rear their young.

There are two main ways in which the qualifying features' continued access to suitable resources could be restricted and distribution affected and this is where assessments should be focussed:

1. Large scale physical barriers, or;
2. Significant disturbance which alters their distribution within the site or disrupts important behaviours.

Temporary short-term disturbances due to human activity may be considered not to compromise the Conservation Objectives within the site provided it can be demonstrated that the population can fully recover with a high degree of certainty. Factors limiting the recovery of the qualifying features include the timing, frequency and duration of the activity around vulnerable stages of their life cycle such as during moulting, during cold weather spells that can increase energy expenditure, or in the pre-migration period.

All qualifying features are protected throughout the whole site, throughout the year. This means that irrespective of the season for which they are designated, the qualifying features are protected during both their breeding and non-breeding seasons when using the SPA.

We anticipate that some locations within the Solway Firth SPA will be more, or less, important than others for individual species. Distributions within the site may also change over time in response to a range of abiotic and biotic factors (e.g. changes in abundance or quality of prey resources at particular locations, numbers of each qualifying feature within the site as a whole, seasonal fluctuations or trends in prevailing weather conditions etc.). In some cases detailed bespoke surveys of bird numbers and distributions, to determine qualifying features' current usage of particular locations within a proposals area of influence, may be required to complete the necessary assessments.

Direct displacement/redistribution of the qualifying features can arise from: barriers to movement to and between foraging and roosting locations; and visual disturbance (e.g. associated with vessel movements; recreation etc.). Indirect displacement/redistribution can arise from loss of or damage to prey or prey-supporting habitats (e.g. through harvesting; physical removal of or damage to seabed; nutrient enrichment; changes to water temperature, salinity, or flows; introduction of INNS; pollution (e.g. light, noise, chemical)).

For all qualifying features: Disturbance to foraging birds may reduce the time spent feeding or cause them to move to different areas that are less energetically profitable. Disturbance that creates an avoidance response or disrupts/reduces roosting behaviour can also put

increased energetic demands on birds. Ensuring safe movement within and between areas used for foraging, roosting and other maintenance behaviours (see also 2c) is important to meet the energetic demands required for winter survival and to achieve or maintain body condition needed to support subsequent migration and successful breeding. Barriers to movement may reduce access to preferred foraging habitat and cause sub-optimal foraging.

Feature	Site-specific advice	Site-specific information
Red-throated diver	<p>Ensure red-throated divers continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to red-throated divers and ensure individuals can move safely between these areas within the site.</p>	<p>Red-throated divers at the Solway Firth SPA will be present in significant numbers during the non-breeding season between mid-September and late March, although some arrive at the Solway Firth SPA from late August. The bulk of the birds arrive post-moult in October and numbers declining from late January and February.</p> <p>Red-throated divers are widely dispersed across the Solway Firth SPA. Key locations have been recorded in the middle and towards the western edge of the shallower inner Solway, reflecting the preferred feeding water depths (typically less than 9m, maximum of 21m, McCluskie <i>et al.</i> 2012; Robbins, 2017), and probable abundance of prey species in less turbid waters. They use these habitats for foraging, resting, and other maintenance activities. However, they will move across much of the site, depending on the conditions and the tide.</p>
Whooper swan	<p>Ensure whooper swans continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p>	<p>Whooper swans are a migratory species. The UK wintering birds are from the Icelandic population, mainly arriving in October and departing for their breeding grounds in March/April. They are a mobile species which travel on a daily basis between feeding grounds and roost sites.</p> <p>Whooper swans also roost on the estuary, with the marshes between Anthorn Marsh and Newton Marsh being particularly important. The species may also roost on areas of open water adjacent to its feeding areas (Madge & Burn, 1988). It is important to maintain linkages to suitable feeding areas outwith the site such as stubbles and grass fields traditionally used by the wintering population. At Solway Firth SPA, when swans are feeding within the site they feed upon the merse (saltmarsh) and freshwater and brackish marshes and coastal bays. Important areas include: RSPB Campfield Marsh, WWT at Eastpark, and Caerlaverock NNR.</p>

	Avoid significant disturbance to whooper swans and ensure individuals can move safely between areas within the site.	The wintering flocks are largely site faithful in terms of feeding and roosting locations subject to intra and inter-specific competition for foraging and roosting spaces. These are largely in the inner Solway, but a smaller wintering flock uses Wigtown Bay.
Barnacle goose	<p>Ensure barnacle geese continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to barnacle geese and ensure individuals can move safely between these areas within the site.</p>	<p>The Solway Firth supports almost the entire Svalbard barnacle goose population which displays strong site fidelity to the SPA. The birds start to arrive during late September and depart from April.</p> <p>Barnacle geese are mobile species which migrate on a daily basis between feeding grounds and roost sites. The geese spend the night roosting on the tidal mud and sandflats, before heading to feed on the merse or agricultural land at dawn. The geese spend the majority of daylight hours foraging before returning to the roost sites at dusk. Key roost sites include the tidal flats at Rockcliffe Marsh, Caerlaverock, Mersehead and Campfield Marsh.</p> <p>The main feeding areas on the Solway are farmland around Caerlaverock and Southernness on the Scottish side and Rockcliffe Marsh and marshes around Moricambe Bayish, Burgh Marsh, the Cardrunk Marshes on the English side. Other areas are increasingly being used; along the River Nith towards Dumfries, further west around Colvend, Auchencairn, Rascarrel and Wigtown later in the winter and to a lesser extent further east around Redkirk and Gretna (WWT, 2020). Rockcliffe Marsh in particular is considered an important departure location when the geese leave the site to return to Svalbard in spring. This may be due to high nitrogen content of red fescue (<i>Festuca rubra</i>) and other saltmarsh plants located within the marsh.</p>
Pink-footed goose	<p>Ensure pink-footed geese continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p>	<p>The population of wintering pink-footed geese arrive on the Solway Firth SPA from September and depart in April. There is considerable movement through the site in autumn and spring with the Solway Firth used as an important staging ground for birds wintering further south and east, as well as a wintering ground and refuge from cold weather events.</p> <p>The species established roosts at the Solway Firth SPA on inter-tidal estuarine areas throughout the autumn and winter. These important roosts are located on Priestside Bank, Blackshaw Bank, Carse Bay, Moricambe Bay and Rockcliffe Marsh. The species may also use areas of saltmarsh for foraging (Mawby, 2018). In Scotland, favoured winter daytime roosting sites include estuarine mudflats, lochs and reservoirs (Madge & Burn, 1988).</p>

	Avoid significant disturbance to pink-footed and ensure individuals can move safely between these areas within the site.	
Common shelduck	<p>Ensure shelduck continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to shelduck and ensure individuals can move safely between these areas within the site.</p>	<p>Shelduck are present all year with a significant number staying to breed within the Solway Firth SPA. In late July and August they leave the site for moulting grounds, most likely to the Waddensea area, but some remain in UK waters to moult. Local breeding birds are augmented by winter immigration from Europe and southern Scandinavia. Their non-breeding period is from September to March, with a flightless moult period between mid-July to mid-October.</p> <p>Shelduck are largely dependent on inter-tidal mud and sand habitats, but also utilise significant saltmarsh areas (including saltmarsh pools) for both feeding and roosting. The majority of the wintering and non-breeding population are distributed in the inner Solway in shallower and more sheltered areas with muddy and fine silt substrates which support favoured food sources such as the mud snail, <i>Hydrobia ulva</i>.</p>
Common teal	<p>Ensure teal continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to teal and</p>	<p>At the Solway Firth SPA numbers of teal build up during August and September as some birds use the estuary to moult. The teal population will be from the GB breeding population as well as being augmented by migrants from Europe and Fennoscandia. Their non-breeding period is from mid-August to April.</p> <p>Teal are widely distributed throughout the Solway Firth SPA with concentrations recorded on the more sheltered areas of the estuary in the Nith estuary and inner Solway. They can be subject to localised, short term within site movements due to weather and site specific disturbance. During winter teal can form large concentrations, with large flocks of 30-40 and sometimes hundreds of individuals gathering at winter roosting sites (Madge & Burn, 1988). Teal are thought to forage more at night during the winter (Kear, 2005).</p>

	<p>ensure individuals can move safely between these areas within the site.</p>	<p>In the winter they will use marshland and sheltered waters with high productivity and abundant vegetation as well as flooded fields and artificial waters (e.g. reservoirs) (Snow & Perrins, 1998). This species may also occur along the coast, on saline or brackish lagoons with abundant submergent vegetation, saltmarshes, tidal creeks, intertidal mudflats, river deltas, estuarine waters and sheltered coastal bays (Madge & Burn, 1988; Kear, 2005). Teal show a preference for marshes with mud flats for foraging rather than more saline or open-water habitats (Johnsgard, 1978).</p>
Northern pintail	<p>Ensure pintail continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to pintail and ensure individuals can move safely between these areas within the site.</p>	<p>Pintails are a migratory species, present at the Solway Firth SPA from September to April during their non-breeding period. Numbers fluctuate considerably, between and within years due in part to weather conditions and availability of inland feeding and roosting.</p> <p>Saltmarshes and sheltered creeks provide important feeding and roosting habitat across a wide area of the inner Solway and associated estuaries.</p> <p>Pintail feed nocturnally, and will roost during the day on open water (Hockey <i>et al.</i> 2005), often forming large flocks. Pintail are a dabbling duck and therefore prefer shallow (10-30cm) water in order to forage (BirdLife International, 2020). During the winter, they may utilise large inland lakes, brackish coastal lagoons, brackish and saline marshes, shallow fresh or brackish estuaries, tidal flats and river deltas with adjacent agricultural land (e.g. stubble fields) (Snow & Perrins, 1998).</p>
Northern shoveler	<p>Ensure shoveler continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p>	<p>Shovelers will be present at the Solway Firth SPA during their non-breeding period between mid-September and April. They will use the Solway Firth SPA for foraging, roosting and other maintenance activities.</p> <p>Within the Solway Firth SPA, wintering shoveler are found on the inner Solway, using sheltered areas of saltmarsh, pools and brackish creeks for feeding. No significant concentrations are located in any one location and the species is quite mobile within the site. Shoveler are found in habitats where there is submerged aquatic vegetation with subsequent abundant planktonic invertebrates (BirdLife International, 2020). In the winter shoveler may use coastal brackish lagoons, tidal mudflats, estuaries, coastal shorelines, fresh and brackish estuarine marshes, and brackish waters, although it generally avoids very saline habitats (BirdLife International, 2020). The species forages diurnally and roosts communally at night</p>

	Avoid significant disturbance to shoveler and ensure individuals can move safely between these areas within the site.	(Brown <i>et al.</i> 1982).
Greater scaup	<p>Ensure scaup continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to scaup and ensure individuals can move safely between these areas within the site.</p>	<p>Scaup wintering in Britain and Ireland are thought to be derived mainly from the Icelandic breeding population (Wright <i>et al.</i> 2012). Scaup will be present at the Solway Firth SPA from mid-September to April. Males tend to remain further north than females or immatures (del Hoyo <i>et al.</i> 1992), which means there may be some sex segregation at their wintering grounds (Madge & Burn, 1988). This species is highly gregarious and can be found in large flocks. Scaup will be using the Solway Firth SPA for foraging, roosting and other maintenance activities.</p> <p>Scaup are highly mobile seaducks and regularly travel between feeding and roosting sites each day. Scaup will be distributed predominately in areas of bivalve beds (e.g. mussels and cockles), rocky scars and the along edge of sandbanks, and will travel between them to feed. Important areas are along the edge of Blackshaw Bank, Mersehead Sands, Castle Point off Rough Firth and the mouth of Moricambe Bay.</p> <p>Scaup roost on the water often forming large rafts and may be encountered almost anywhere on the site. The distribution reflects favoured feeding areas in deeper parts of the inter-tidal areas of the estuary with movement across the tidal cycle and where sheltered feeding and roosting is available. They prefer shallow marine waters, having a maximum foraging depth of 10m (McCluskie <i>et al.</i> 2012), as well as using estuaries and brackish lagoons (del Hoyo <i>et al.</i> 1992). Scaup are considered to be mainly nocturnal feeders (Woodward & Humphreys, 2018).</p>
Common scoter	Ensure common scoter continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.	The common scoter GB wintering population is derived mainly from Scandanavian and Icelandic breeding populations (Wernham <i>et al.</i> 2002). Common scoter will be present in the Solway Firth SPA between July and April. Their flightless moult period lasts for around 3-4 weeks and will be between mid-July and mid-September for males and September-October in females. The Solway Firth SPA is an important post-breeding moulting area with significant late summer populations. The Solway Firth SPA is also used as an important staging point for common scoters. Common scoters appear to be faithful to specific locations, suggesting these provide the optimal conditions in terms of food availability and shelter from both weather and human disturbance.

	<p>and</p> <p>Avoid significant disturbance to common scoter and ensure individuals can move safely between these areas within the site.</p>	<p>Common scoter can be found throughout the Solway Firth SPA, with particular concentrations along the western coastlines and in the firth by Wigtown. A further concentration has been recorded between Workington and Whitehaven. As the scoters are dependent on bivalve molluscs they have been recorded in the sandbanks of Merserhead and Barnhour Sands (Hartley, 2007). Common scoters use open coast habitats, usually with a depth of 20m or less (Woodward & Humphreys, 2018). Common scoters typically dive to around 10m (Robbins, 2017).</p>
Common goldeneye	<p>Ensure goldeneye continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to goldeneye and ensure individuals can move safely between these areas within the site.</p>	<p>The goldeneye GB wintering population is thought to come from the Scandinavian breeding population (Wright <i>et al.</i> 2012). Goldeneyes will be present at the Solway Firth SPA from September to mid-April. Post-breeding flightless wing moult lasts 3-4 weeks from mid-July to mid - September in males and around 3 weeks later in females. Numbers are swelled during severe cold weather if inland waterbodies are frozen and unavailable as feeding areas.</p> <p>Goldeneye tend to concentrate in more sheltered areas of the inner Solway in the main river channels, of the Sark, Esk, Eden, Nith and Wigtown Bay. Goldeneye use a range of shallow freshwater, brackish and marine waters in the non-breeding season and are commonly associated with estuaries (Woodward & Humphreys, 2018) and may also feed by sewage outfalls. They feed predominantly during the day and have a maximum dive depth of 6m (Woodward & Humphreys, 2018).</p>
Goosander	<p>Ensure goosander continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p>	<p>Goosanders will be present at the Solway Firth SPA throughout the year. Wintering goosander at the Solway Firth SPA are thought to be largely derived from the British breeding population, but some may migrate from Europe during periods of cold weather. Males from British breeding populations migrate to Norway returning to Britain between November and January but most females and juveniles are considered to remain in Britain throughout the year (Wright <i>et al.</i> 2012). Their non-breeding period is from mid-August to April.</p> <p>Goosanders wintering within the Solway Firth SPA will use estuaries, coastal lagoons and sheltered sea coasts, normally in waters of less than 10m deep (Scott & Rose, 1996). When roosting, goosanders prefer to do so communally (Cramp & Simmons, 2004). Concentrations</p>

	Avoid significant disturbance to goosander and ensure individuals can move safely between these areas within the site.	of goosanders are known off Allonby Bay, the inner Solway near Annan, River Nith off Southerness and Carsethorn and outer Solway off Rough Firth and Balcary Point. At Solway Firth SPA goosanders make use of freshwater roost sites throughout the area including both still waters and tidal-mouth areas.
Eurasian oystercatcher	<p>Ensure oystercatcher continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to oystercatcher and ensure individuals can move safely between these areas within the site.</p>	<p>Oystercatchers have their non-breeding period from September to mid-March, although oystercatchers will be present throughout the year at the Solway Firth SPA. Significant population turnover is thought to occur during the non-breeding period and cold weather movements from east coast estuaries augment populations.</p> <p>Oystercatchers wintering on the Solway Firth SPA feed extensively on intertidal mud and sand flats of Blackshaw and Priestsides Banks, in Wigtown Bay, Moricambe Bay and the outer Solway coast. Mussel and cockle beds are important feeding areas. In the winter this species uses coastal habitats, frequenting estuarine mudflats, saltmarshes and sandy and rocky shores (del Hoyo <i>et al.</i> 1996). Oystercatchers often form large flocks when roosting.</p>
Northern lapwing	<p>Ensure lapwing continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p>	<p>Lapwings in Scotland are partially migratory with some non-breeding birds being from the Scottish breeding population and others being migrants from Fennoscandia. Lapwing non-breeding season is from August to March at the Solway Firth SPA.</p> <p>Lapwings preferred foraging habitats within the Solway Firth SPA include mud and sand, shingle and saltmarsh, with most birds concentrated on the inner Solway. Areas of importance for lapwing at the Solway Firth SPA include: Green Merse, Kirkconnell Merse, Caerlaverock and Priestsides, Rockcliffe merse, Anthorn and Newton and Moricambe Bay. There are important roosts at Caerlaverock, on the Kirkconnell Merse, Sandsfield to Dykesfield and Herdhill Scar to Cardurnock. Lapwings are vulnerable to loss of optimal foraging habitat and</p>

	Avoid significant disturbance to lapwing and ensure individuals can move safely between these areas within the site.	food resources as a result of changes to the mud and sand substrates on which they preferentially feed.
Golden plover	<p>Ensure golden plover continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to golden plover and ensure individuals can move safely between these areas within the site.</p>	<p>Wintering golden plovers are likely to be made up of breeding birds from Iceland, Faroe Islands, and UK breeding populations. They will be present during the non-breeding period at the Solway Firth SPA from August to May.</p> <p>Favoured areas for golden plovers within the Solway Firth SPA include: the Mersehead sands, Blackshaw Bank and Priests side Bank, saltmarsh of the River Nith, Caerlaverock, Priests side merse, Rockcliffe Marsh, Moricambe Bay, and the inner Solway. Golden plovers are frequently associated with lapwing for both foraging and roosting habitats. In their winter, golden plovers may use freshwater wetlands, grasslands, pastures, agricultural land (e.g. stubble, ploughed or fallow fields) also will also forage on tidal shores, coastal rocky outcrops, intertidal flats, and saltmarshes in shallow bays and estuaries (references within BirdLife International, 2020).</p>
Grey plover	<p>Ensure grey plover continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p>	<p>Grey plovers are a migratory species which breed in the High Arctic, and will be present during the non-breeding period at the Solway Firth SPA from August to April.</p> <p>Grey plover are present in relatively small numbers across the inner Solway on sandy and shingle feeding substrates. Roosting occurs often in association with larger flocks of golden plover and lapwing. These include Kirkconnell Merse, Caerlaverock, Priests side and a significant roost at Herdhill Scar to Cardurnock. Grey plovers may use intertidal mudflats, saltmarshes, sandflats, beaches, bays and estuaries as foraging and resting habitats (BirdLife International, 2020).</p>

	Avoid significant disturbance to grey plover and ensure individuals can move safely between these areas within the site.	
Ringed plover	<p>Ensure ringed plover continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to ringed plover and ensure individuals can move safely between these areas within the site.</p>	<p>The Solway Firth SPA is an important staging post for ringed plover breeding further north than GB on spring and autumn passage. Peak numbers occur in May with often a relatively short peak period of passage through the site. A wintering population is present on the site between August and April, with a small dispersed breeding population on shingle and sandy shores also known to use this site. As such, ringed plovers may be seen throughout the year at the Solway Firth SPA.</p> <p>Key areas for ringed plovers at the Solway Firth SPA include: Mersehead sands, Gillfoot Bay, Allonby Bay to Grune Point, Rockcliffe Marsh, Blackshaw and Priestsides Banks, Newbie and Grune Point. Ringed plovers use a mix of sand, mud, shingle and cobble substrates on which to feed with specific roost locations.</p>
Red knot	<p>Ensure knot continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to knot and</p>	<p>Wintering knot on the Solway Firth SPA originate from breeding populations in Arctic North America, Greenland and Siberia. They are present at the Solway Firth SPA between August and May, with large numbers seen a high tide roosts between December and March.</p> <p>Knot foraging habitats are predominantly on muddy or sandy substrates. There are significant knot roosts, to which birds are highly faithful, located on the inner Solway at Mersehead, Caerlaverock, Priestsides, Newbie, Browhouses and Grune point. During the winter, knots will use various coastal habitats including: tidal mudflats or sandflats, sandy beaches, sheltered coasts, rocky shelves, bay, lagoons and harbours, occasionally also using beaches and saltmarshes (del Hoyo <i>et al.</i> 1996).</p>

	ensure individuals can move safely between these areas within the site.	
Dunlin	<p>Ensure dunlin continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to dunlin and ensure individuals can move safely between these areas within the site.</p>	<p>The wintering population of dunlin at the Solway Firth SPA is made up of birds breeding in Greenland, Iceland, Scandinavia and Russia. The estuary is likely to be an important staging post for birds wintering further south as far as west Africa. Their non-breeding period is from August to April. Some juvenile dunlin may remain in their non-breeding season range throughout the year.</p> <p>Favoured feeding areas for dunlin at the Solway Firth SPA are predominantly muddy and sandy shores, although mixed substrates of shingle and sand are used on the inner Solway with and are also routinely used as high tide roosts. These are on Mersehead, Caerlaverock, Priestside, Newbie, Browhouses Dykesfield to Glasson, Glasson to Herdhill Scar, Herdhill Scar to Cardurnock, Moricambe, Calvo Marsh and Grune Point. The species is active both diurnally and nocturnally (del Hoyo <i>et al.</i> 1996).</p>
Sanderling	<p>Ensure sanderling continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to sanderling and ensure individuals can move</p>	<p>The Solway Firth SPA is an important migration staging post in spring and autumn with significant numbers present during late April to early June in particular. Both Siberian and Greenland breeding birds winter in the UK at sites such as Solway Firth SPA. Sanderling non-breeding season is from September to July.</p> <p>Within the Solway Firth SPA, sanderling are almost exclusively found on sandy feeding areas and traditional roosts on the inner Solway at Mersehead, Southernness, Gillfoot Bay, Caerlaverock, Priestside, Newbie, Grune Point, Beckfoot to Silloth, Mawbray to Beckfoot, Bankend to Blue Dial and Maryport. Sanderling at the Solway Firth SPA tend to roost on the marshes or on the edges of the mudflats.</p>

	safely between these areas within the site.	
Common redshank	<p>Ensure redshank continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to redshank and ensure individuals can move safely between these areas within the site.</p>	<p>Redshank have their non-breeding period from August to April at the Solway Firth SPA. Most redshank wintering at the Solway Firth SPA will be Icelandic breeding birds, with a small proportion from Scandinavian and UK breeding populations. A number of redshank will be at the SPA year round, with breeding birds being present on a number of marshes and nearby wet grasslands.</p> <p>At the Solway Firth SPA important feeding and roosting areas for redshank are on muddy substrates on the inner Solway and Wigtown Bay with high tide roosts on adjacent shingle areas. These include Mersehead, Southernness, Carse bay, Caerlaverock, Priests side, Newbie, Glasson to Herdhill Scar, Grune Point and Maryport. The merse can be an important feeding and roosting area on bigger tides at this SPA. Redshank will use the coast extensively and are site faithful in winter, particularly feeding on rocky and pebble skears.</p>
Bar-tailed godwit	<p>Ensure bar-tailed godwit continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to bar-tailed godwit and ensure individuals can move safely between</p>	<p>Bar-tailed godwits are a migratory species from the Arctic, which arrive at the Solway Firth SPA for their wintering period. Their main non-breeding season is from August-April, with highest numbers being seen between November and February.</p> <p>Bar-tailed godwits are highly mobile and regularly travel between feeding and roosting sites each day. These waders feed upon the tidal mud and sandflats within the SPA when the tide is low. At high tide, the godwits return to roost on the saltmarsh. The outer Solway shore from Allonby to Grune is an important roost site for this species, with Grune Point being of particular importance as it is least disturbed.</p> <p>Bar-tailed godwits at the Solway Firth SPA favour both muddy and sandy substrates as feeding areas and use traditional roosts on the inner Solway at Mersehead, Carse Bay, Caerlaverock, Priests side, Newbie, Grune Point and Wigtown Bay. During the winter it is more common in intertidal areas along muddy coastlines, estuaries, inlets, and sheltered bays with tidal mudflats or sandbars (BirdLife International, 2020).</p>

	these areas within the site.	
Ruddy turnstone	<p>Ensure turnstone continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to turnstone and ensure individuals can move safely between these areas within the site.</p>	<p>Turnstones that have migrated from Canada and Greenland will arrive for their wintering period in August and depart around May. Turnstones from northern Europe may pass through the Solway Firth SPA on their migration July/August and then again on their return migration in spring. Thus, turnstones will be present at the Solway Firth SPA throughout most of the year, although fewer are seen in mid-summer.</p> <p>Turnstones almost exclusively use boulder, cobble and shingle substrates throughout the Solway Firth SPA. This restricts their distribution to key locations with small feeding flocks and roosts scattered across suitable habitat. Favoured areas include hard shores on Wigtown Bay, Southerness, Newbie and Maryport to Flimby. The species is highly adaptable to foraging in natural and man-made habitats. In their wintering period turnstones may also use breakwaters, sandy beaches with storm-wracked seaweed, short-grass saltmarshes, sheltered inlets, estuaries, and mudflats with beds of molluscs (del Hoyo <i>et al.</i> 1996).</p>
Eurasian curlew	<p>Ensure curlew continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to curlew and ensure individuals can move safely between these areas within the site.</p>	<p>Curlews will be present at the Solway Firth SPA predominantly during the non-breeding season is from August to April. However, some will be present throughout the year, as there are limited breeding sites near to the Solway Firth on the Solway plain.</p> <p>During the winter curlew use muddy coasts, bays and estuaries with tidal mudflats and sandflats, rocky and sandy beaches with many pools, saltmarshes, coastal meadows and pasture and muddy shores of coastal lagoons, (BirdLife International, 2020). Curlews may also utilise wet grassland and arable fields during migration (del Hoyo <i>et al.</i> 1996). They are found widely distributed around the Solway Firth SPA coastline. At the Solway Firth SPA they prefer to roost on undisturbed marshes and marsh fringes as well as on some beaches. They particularly like feeding on the intertidal substrates including mud flats, sand flats and cobble skears.</p>

Great cormorant	<p>Ensure cormorant continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to cormorant and ensure individuals can move safely between these areas within the site.</p>	<p>Cormorants are present at the Solway firth SPA throughout the year. There are coastal breeding colonies on the outer Solway and two on the inner Solway with an inland breeding colony in Wigtownshire. This breeding population will feed into the wintering population at the SPA. Their non-breeding period is from mid-September to mid-February.</p> <p>Cormorants are widely distributed across the Solway Firth SPA, utilising both the outer estuary and tributary estuaries and rivers discharging to the Solway Firth. Cormorants at the Solway Firth SPA have been recorded roosting on undisturbed beaches along the outer-Solway from Aoolny to Grune Point, with major roosts existing at Workington Harbour and at St Bees Head. Cormorants tend to roost communally (Brown <i>et al.</i> 1982). Cormorants will use the coastal environment including estuaries, coastal lagoons and sheltered bays, tending to avoid deep water, rarely diving below 10m, though they have been recorded diving as deeply as 35m (Gremillet <i>et al.</i> 2003). Several studies have shown that this species may forage up to 20-25 km from its wintering roosts or breeding colonies, though trips of up to a 35 km radius have been recorded (Gremillet, 1997).</p>
Black-headed gull	<p>Ensure black-headed gull continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to black-headed gull and ensure individuals can move safely between these areas within the site.</p>	<p>Black-headed gulls will be present at the Solway Firth SPA throughout the year, with their non-breeding period being from September to March.</p> <p>Black-headed gulls are highly mobile species, widely distributed across the Solway Firth SPA. They will utilise the full range of habitats, both natural and man-made on the site. Non-breeding black-headed gulls use the Solway Firth SPA primarily for roosting, but will also use the site for foraging, loafing and other maintenance activities. It is not currently known if they have preferred locations within the SPA where they roost. Wintering black-headed gulls are known to use coastal and intertidal waters, preferring sandy or muddy beaches and tend to avoid rocky or more exposed coasts. When roosting, they prefer to do so in a large flock, and will use marine and estuarine areas as their night-time roosts.</p> <p>Black-headed gulls will also use areas within the Solway Firth SPA for foraging. When feeding in the marine environment they will surface plunge, occasionally fully submerging. Black-headed gulls have a maximum foraging range of 18.5 within the breeding period (Woodward <i>et al.</i> 2019), though this is likely to be more during the non-breeding period. Within the Solway Firth SPA black-headed gulls are likely to also use coastal and inter-tidal foraging areas.</p>

Common gull	<p>Ensure common gull continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to common gull and ensure individuals can move safely between these areas within the site.</p>	<p>Common gulls will be present at the Solway Firth SPA throughout the year, with numbers increasing during their non-breeding season between September and March. Common gull breed at the Solway Firth SPA at a small number of locations. Adult gulls will have a partial moult before the breeding season, a summer moult and a winter moult, though these moults do not render the adults flightless. The wintering population is augmented by birds from Scandinavia, Russia and the low countries.</p> <p>Non-breeding common gulls use the Solway Firth SPA primarily for roosting, but will also use the site for foraging, loafing and other maintenance activities. Common gulls are dispersed across the Solway Firth SPA but a major roost area has been recorded in Allonby Bay. They will utilise the full range of habitats, both natural and man-made on the site. Common gulls have a preference for drier, well-drained soils and use estuarine mudflats and sandy beaches for roosting and foraging. The surface canopy of kelp forests or drifting kelp mats may also be used as gull resting/roosting sites (Foster & Schiel, 1985).</p> <p>There is a lack of information on foraging range for this species, but 50km maximum has been recorded during the breeding season (Woodward <i>et al.</i> 2019). In the marine environment, common gulls will feed from the surface or feed by surface dipping. They will also forage in intertidal and coastal habitats. Common gulls have been recorded foraging within the Solway Firth SPA, plunging for small fish.</p>
Herring gull	<p>Ensure herring gull continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated with the site.</p> <p>and</p> <p>Avoid significant disturbance to herring gull and ensure individuals can move</p>	<p>Herring gulls are present at the Solway Firth SPA throughout the year. A number of breeding colonies occur around the entire coastline of the site and some of these birds will form part of the wintering population, augmented by birds from Iceland and Scandinavia. Their breeding season is from March to the end of August, and their non-breeding period from September to end of February. Herring gulls use the Solway SPA for roosting.</p> <p>Non-breeding herring gulls use the Solway Firth SPA primarily for roosting, but will also use the site for foraging, loafing and other maintenance activities. Herring gulls are widely dispersed across the Solway Firth SPA year round, but a major roost area has been recorded in Allonby Bay. They will utilise the full range of habitats, both natural and man-made on the site. The surface canopy of kelp forests or drifting kelp mats may also be used as gull resting/roosting sites (Foster & Schiel, 1985).</p> <p>As well as roosting within the Solway Firth SPA, non-breeding herring gulls will use areas within the SPA for foraging. In the breeding period, herring gulls have a mean maximum</p>

	safely between these areas within the site.	foraging range of 58.8 ± 26.8 km (Woodward <i>et al.</i> 2019), though in the non-breeding season their foraging range will be much larger. Herring gulls feeding in the marine environment are largely surface feeders, scavengers, and predators. They can dive up to 2m for prey items (Pierotti & Good, 1994).
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2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored.

This objective seeks to maintain, or where appropriate restore, the current extent, quality and distribution of supporting habitats within the site as well as ensure a sufficient food supply within the site. It also recognises however, that the populations of bar-tailed godwit, scaup, lapwing, grey plover, knot, curlew, goldeneye, and turnstone at the Solway Firth SPA are in unfavourable condition and that this may, in part, be due to a reduction in prey or habitat causing declines.

The qualifying features require suitable habitat for shelter, roosting, foraging, loafing, moulting and other maintenance activities. The variety, quality, abundance and availability of food resources on which the qualifying features depend is important for ensuring adult fitness, survival and breeding success (including for over-wintering species). The supply of food resources is supported by environmental processes.

In the marine environment, supporting habitats refer to the characteristics of the seabed and water column relevant to their use by the qualifying features. Supporting processes relates to wider oceanographic processes such as up-wellings, tidal flows, hydrological movements which may be necessary for the habitat, and thus affects nutrient cycling and prey distribution.

In the terrestrial environment, supporting habitats refer to the characteristics of the intertidal, shore, mudflat areas relevant to their use by the qualifying features. Supporting processes relates to wider processes such as nutrient movements flowing into and within the SPA, the hydrology of water across the mudflats, and factors affecting vegetation formation, all of which will influence the habitat types and prey distribution available for the qualifying features.

Maintenance of prey species and their supporting habitats is important to maintain the conditions required to support the qualifying features populations.

Temporary short-term changes in supporting habitat and/or food resources due to human activity may be considered not to compromise the Conservation Objectives within the site provided it can be demonstrated with a high degree of certainty that the populations of any affected qualifying features can fully recover. The species-specific information includes a summary of available information on food resources and where known, the distribution of the key supporting habitats and associated processes within the Solway SPA.

The overall water body condition status relevant to the Solway Firth SPA was assessed as “Poor” in 2020 (majority of the SPA within the area called ‘Solway Firth’), or “Good” or “High” in the remaining areas for where an assessment is available⁹. This assessment includes consideration of water chemistry, pollutants, the physical condition of the water body, plant and animal communities, including plankton, and the risk from invasive non-native species.

There is currently insufficient information to provide quantitative advice on the environmental processes associated with the supporting habitats and prey of the qualifying features at the Solway Firth SPA.

Feature	Site-specific advice	Site-specific information
Red-throated diver	<p>Maintain the extent and distribution of the supporting habitats for red-throated diver within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Red-throated divers require suitable habitat for foraging, resting, and other maintenance activities. Red-throated divers are most likely to be found over shallow, flat, sandy substrates close to shore (Gray <i>et al.</i> 2015).</p> <p>Relatively little is known about the diet of red-throated divers in the non-breeding season. The available evidence indicates a diet of fish, both benthic and pelagic, of up to 25-30cm in length, but typically smaller with species and size composition reflecting seasonal and local availability. Fish species include herring, whiting, gobies, sticklebacks and smelt (Woodward & Humphreys, 2018). River channels and open estuaries are also key prey-supporting habitats which provide habitat for fish accessible as prey items to red-throated divers using the site. Access to the wider marine environment and connectivity with offshore fish populations which use the estuary and rivers which drain to the Solway Firth SPA is a key component to support the species on the site.</p> <p>The key supporting processes for red-throated divers at the Solway Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow. Recent research has found an association between diver abundance and the edges of estuarine frontal zones, particularly during times at high and low tide when they are dominated by slack water (Skov <i>et al.</i> 2016). Birds follow the trailing edge of the coastal current and abundance may also be also linked to shallow areas, high chlorophyll a and low sea surface temperature and salinity (Skov & Prins, 2001). In</p>

⁹ <https://www.sepa.org.uk/data-visualisation/water-classification-hub/>

		<p>the German Bight, divers were not recorded in waters with a surface salinity above 34 psu¹⁰ (Skov & Prins, 2001), suggesting salinity could also affect their distribution</p>
<p>Whooper swan</p>	<p>Maintain the extent and distribution of the supporting habitats for whooper swan within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>A significant proportion of the whooper swan feeding areas are regularly used within and between years and include saltmarsh, freshwater marshes and wet grasslands within the site and autumn and winter stubbles and grass fields outwith the site. The Caerlaverock NNR also provide feeds, as well as disturbance-free farmland for the swans to forage within (Black & Rees, 1984). Maintenance within natural fluctuations the extent, distribution and quality of saltmarsh habitat is required.</p> <p>Whooper swans are largely herbivorous, feeding predominately upon the agricultural fields surrounding the SPA. Favoured agricultural foods include barley stubble, grasses, winter-sown cereals and potatoes left over from harvest. The Caerlaverock NNR provide feeds, as well as disturbance-free farmland for the swans to forage within. Whooper swan also forage within the marsh and merge for saltmarsh vegetation and aquatic plants. Adults may supplement their diet with marine and freshwater mussels (Kear, 2005).</p> <p>Potential expansion of saltmarsh through managed retreat should be considered. Large waterbodies are an important habitat for this species, especially when loafing. The extent and number of waterbodies should be maintained. Swans forage for aquatic plants within standing water with depths of under 1m. Suitable foraging habitat for this species should be maintained.</p> <p>The key supporting processes for whooper swans at the Solway Firth SPA include hydrology of key waterbodies. Natural variation in water levels are important for foraging, large waterbodies are an important habitat for this species, especially when loafing and water depth is important; swans forage for aquatic plants within standing water with depths of under 1m. Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels, and natural levels</p>

¹⁰ Practical Salinity Unit (a measure of the salt concentration in sea water)

		<p>of turbidity. Natural variation in water levels across waterbodies is important for whooper swan foraging, and should be maintained.</p> <p>Open and unobstructed terrain and overall field sizes in and around roosting and feeding areas is important for early predator detection. The swans prefer short sward heights and may have difficulty feeding if the vegetation is too tall (SNH, 2018). Vegetation is managed in many areas, such as within Caerlaverock NNR, by cattle grazing in later summer to achieve variation in sward height and diversity before the overwintering species return to the Solway. Sward height should be managed across the SPA to maintain suitable foraging habitat for this species. Maintain the extent and distribution of predominantly short (<10 cm) grassland swards in areas used for feeding.</p>
Barnacle goose	<p>Maintain the extent and distribution of the supporting habitats for barnacle goose within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>A significant proportion of the barnacle goose feeding areas are regularly used within and between years and include saltmarsh, freshwater marshes and wet grasslands within the site and autumn and winter stubbles and grass fields outwith the site. Protection of roosts close to feeding areas from disturbance is required to enable access between feeding and roosting locations, and maintenance within natural fluctuations of the extent, distribution and quality of saltmarsh habitat.</p> <p>Barnacle geese are herbivorous, eating leaves, stems and seed heads of aquatic plants, mosses, herbs, and shrubs, as well as taking agricultural grain during the winter (BirdLife International, 2020). The barnacle goose has a wide and varied diet, which allows it to build up significant weight during the winter period. During daylight hours, the geese spend the vast majority of time feeding upon either the merse (saltmarsh) surrounding the estuary. Key plant species include red fescue (<i>Festuca rubra</i>), saltmarsh grass (<i>Puccinella maritima</i>), clover (<i>Trifolium repens</i>) and 'mad rush' (<i>Juncus gerardii</i>).</p> <p>Open and unobstructed terrain is important for the barnacle goose when foraging and roosting, so that predators can be detected. The openness of the tidal flats make ideal roost sites for barnacle geese for this reason. Key roosting and foraging sites should be kept free from obstructions which may impair line-of-sight for this species. Barnacle geese feed upon saltmarsh and farmland.</p>

		<p>The geese prefer short sward heights and may have difficulty feeding if the vegetation is too tall. Maintain the extent and distribution of predominantly short (<10 cm) grassland swards in areas used for feeding. Vegetation is managed in many areas, such as within WWT Caerlaverock NNR, by cattle grazing in later summer to achieve variation in sward height and diversity before the geese return to the Solway (SNH, 2018). Sward height should be managed across the SPA to maintain suitable foraging habitat for this species. Maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels, and natural levels of turbidity.</p>
Pink-footed goose	<p>Maintain the extent and distribution of the supporting habitats for pink-footed goose within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Maintenance within natural fluctuations the extent, distribution and quality of saltmarsh habitat to support feeding pink footed geese both on migration and over-wintering is required as an essential objective. Access to autumn and winter stubbles and grass pasture will provide feeding opportunities. The geese spend the night roosting on the tidal mud and sandflats, before heading to feed on the merse or the surrounding agricultural land at dawn to feed.</p> <p>Pink-footed geese are herbivorous and opportunistic foragers (BirdLife International, 2020). Cereal grains, stubble fields, pasture grasses and potatoes are all important food sources for this species, whilst the merse is also grazed (SNH, 2018). Clover (<i>Trifolium repens</i>) and common meadow-grass (<i>Poa pratensis</i>) are particularly important for this species. When feeding and roosting within adjacent farmland, pink-footed geese require large and open fields to allow for early detection of predators. Key roosting and foraging sites should be kept free from obstructions which may impair line-of-sight for this species. The geese prefer short sward heights and may have difficulty feeding if the vegetation is too tall. Vegetation is managed in many areas, such as within Caerlaverock NNR, by cattle grazing in later summer to achieve variation in sward height and diversity before the geese return to the Solway.</p>
Common shelduck	<p>Maintain the extent and distribution of the supporting habitats for shelduck within the site.</p>	<p>Shelduck require suitable habitat for foraging, resting, and other maintenance activities. Maintenance within natural fluctuations, the extent, distribution and quality of saltmarsh and inter-tidal habitat to support feeding is an essential requirement.</p>

	<p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Shelduck are reliant on key areas where fine silts and muds which support molluscs on which they predominantly feed. Salt-water molluscs such as <i>Hydrobia spp.</i> form a large part of the shelduck diet, but they may also feed on aquatic invertebrates (insects, crustaceans, worms), small fish, fish spawn and plant material (algae, seeds and agricultural grain) (BirdLife International, 2020). Shelduck may also indirectly use seaweed for foraging when feeding intertidally on invertebrates (Goodship & Furness, 2019). They feed by either surface digging or scything in exposed mud or shallow water, or by dabbling and head-dipping into shallow water.</p> <p>Maintenance of natural processes which create the finer sediments on which shelduck feed is dependent on factors outwith the site including fluvial flood events and resultant erosion.</p>
Common teal	<p>Maintain the extent and distribution of the supporting habitats for teal within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting</p>	<p>Teal require suitable habitat for foraging, resting, and other maintenance activities. Maintenance within natural fluctuations, the extent, distribution and quality of saltmarsh and inter-tidal habitat to support feeding opportunities for teal.</p> <p>Provision of undisturbed feeding and roosting refuges are also required to support teal populations on the site. Maintain or where possible extend access to seed sources on pioneer, low to middle saltmarsh through appropriate summer livestock (preferably cattle) grazing. Maintain and extend access to sheltered creeks for both feeding and roosting, particularly as these species are less tolerant to repeated human disturbance.</p> <p>During winter teal feed predominantly on seeds of aquatic plants (e.g. emergent and submerged macrophytes), grasses, sedges and agricultural grain (cereals and rice) (Kear 2005; del Hoyo <i>et al.</i> 1992). Teal will generally only take seeds of a certain size (1-2.6mm) (Cramp & Simmons, 2004).</p> <p>The supporting processes for teal at the Solway Firth SPA are not well known. In freshwater environments it has been shown that clearer water with less nutrient enrichment has benefitted teals, most likely due to increases in their food supply as</p>

	habitats and/or prey, should be avoided.	a result of improved water quality (Fox <i>et al.</i> 2019). It is not known if the same applies to when they are foraging in more brackish and estuarine environments, such as those in the Solway Firth SPA.
Northern pintail	<p>Maintain the extent and distribution of the supporting habitats for pintail within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Pintails require suitable habitat for foraging, loafing and roosting within this SPA. Large inland lakes, brackish coastal lagoons, brackish and saline marshes, shallow fresh or brackish estuaries, tidal flats and river deltas with adjacent agricultural land (e.g. stubble fields) may all be habitats used for these activities.</p> <p>Pintail are omnivorous and opportunistic dabbling ducks which forage across the extensive shallow waters, tidal mudflats, sandflat, saltmarsh and cockle beds within the SPA, feeding upon a variety of aquatic plants, insects and other invertebrates. Small molluscs are important prey, including small marine snails (<i>Hydrobia</i> spp.) and the Baltic tellin (<i>Limecola balthica</i>). Pintail often fed on the seeds of saltmarsh plant when the marsh is submerged and the seeds are accessible from the water. Pintails tend to feed nocturnally. Key roost sites can be found at RSPB Mersehead and WWT Caerlaverock.</p> <p>Supporting habitats and associated processes that are important for pintail will relate to ensuring saltmarshes can set seed and ensuring invertebrate rich sediments are present at the site. Pintail require shallow water to forage for aquatic plants and invertebrates. Areas with suitable depth for foraging (0.1 to 0.3m) should be maintained.</p>
Northern shoveler	<p>Maintain the extent and distribution of the supporting habitats for shoveler within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p>	<p>Shovelers require suitable habitat for foraging, loafing and roosting within this SPA. They use coastal brackish lagoons, tidal mudflats, estuaries, coastal shorelines, marshes and saline inland waters for these activities at the Solway Firth SPA, occasionally also using marine waters. Saltmarsh with muddy pools are key habitats for them at the site.</p> <p>Shovelers are dabbling ducks, with a specialised feeding technique when surface feeding involving sweeping the surface of the water with their beak, filtering out food particles. Their diet consists of small aquatic invertebrates such as adult and larval insects (e.g. caddisfly larvae, damselfly and dragonfly nymphs, adult beetles, bugs and flies), molluscs, planktonic crustaceans, the seeds of emergent and aquatic plants (e.g. bulrushes and waterweeds), annelids, amphibian spawn,</p>

	<p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>tadpoles, spiders, fish and the vegetative parts of aquatic plants (e.g. duckweeds) (BirdLife International, 2020).</p> <p>The supporting processes for shovelers at the Solway Firth SPA are not well known. In freshwater environments it has been shown that clearer water with less nutrient enrichment has benefitted shovelers, most likely due to increases in their food supply as a result of improved water quality (Fox <i>et al.</i> 2019). It is not known if the same applies to when they are foraging in more brackish and estuarine environments such as those in the Solway Firth SPA.</p>
Greater scaup	<p>Maintain the extent and distribution of the supporting habitats for scaup within the site.</p> <p>and</p> <p>Ensure the variety and abundance of food resources and the condition of supporting habitats and associated processes have the ability to recover.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Scaup require suitable habitat within the SPA for foraging, loafing and roosting. Maintenance of inter-tidal and subtidal habitats which support food resources, primarily bivalves which support the non-breeding population, is important. Scaup prefer shallow waters, having a maximum dive depth of 10m (Sotheran <i>et al.</i> 2019). They are normally associated with sandy substrates and over the <i>Zostera</i> zone or over blue mussel beds.</p> <p>Scaup feed predominately upon bivalve beds (e.g. mussels and cockles), rocky scars and the along edge of sandbanks, and will travel between them to feed. Especially important areas within the Solway Firth SPA are along the edge of Blackshaw Bank, Mersehead Sands and the mouth of Moricambe Bay. Scaup roost on the water and form large rafts.</p> <p>Scaup are diving ducks, which will also dabble in shallow waters. Scaup diet consists predominantly of bivalves including mussels (<i>Mytilus edulis</i>) and cockles (<i>Castroderma edule</i>), which are often located on rocky scar ground. Scaup may also indirectly rely on seaweed for foraging requirements due to the association of seaweed with benthic infauna (Goodship & Furness, 2019). Scaup also forage in the shallow waters along the edge of sandbanks, such as at Blackshaw Bank, the ducks dive for molluscs, crustaceans and aquatic plants.</p> <p>Benthic habitats capable of supporting the principal bivalve and/or gastropod prey species of scaup may be relatively extensive in area within the SPA and the prey distributions and abundance within suitable habitats will vary both spatially and temporally. However some areas within accessible foraging depths are likely to</p>

		<p>more consistently support relatively higher biomass of benthic prey. Information on these locations is currently lacking for the Solway Firth SPA.</p> <p>The key supporting processes for scaup at the Solway Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow. Scaup may benefit from improved transparency of waters where it can lead to recovery of eutrophication-sensitive prey (Pringle & Burton, 2017). As scaup have previously been recorded feeding directly on sewage and industrial waste outfalls (Pringle & Burton, 2017), water with high levels of nutrients may be suitable for them and thus a reduction in nutrients may also affect this species. Tidal races are strongly avoided and previous studies have shown they favour areas of low water current due to the presence of sediment-type for foraging (Jones & Drobney 1986; Furness <i>et al.</i> 2012).</p> <p>Maintain existing water quality which support food resources for the species and avoid disease and toxin accumulations from the wider marine and terrestrial environments through the River basin Management Planning measures, is also advised. Suitable depths are required for effective foraging for this species. Maintain the availability of water of 2-6 m deep.</p>
Common scoter	<p>Maintain the extent and distribution of supporting habitats for common scoter within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in</p>	<p>Common scoters require suitable habitat for foraging, loafing and roosting within this SPA. They are normally found in open coast habitats, in shallow waters of 20m or less (Woodward & Humphreys, 2018). However, they will regularly swim (and occasionally fly) to deeper water further offshore to roost at night (Mudge & Allen, 1980). It is important that there is no net loss of supporting habitat for the species and the food sources available. This includes maintaining inter-tidal and subtidal habitats which support food resources, primarily bivalves which support the non-breeding population of common scoter.</p> <p>Common scoter diet in winter is almost exclusively bivalves, and they will preferentially feed on the most locally abundant species (Woodward & Humphreys, 2018). In the UK, key prey items include: common cockle, Baltic clam, and the bivalve <i>Nucula sulcata</i> with blue mussel, surf clams (specifically <i>Spisula subtruncata</i>), soft-shell clam, <i>Cardium lamarckii</i>, and Atlantic jackknife clam recorded from studies elsewhere in Europe (Woodward & Humphreys, 2018).</p>

	<p>nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Some studies also indicate that other food groups including gastropods, crustaceans and echinoderms are occasionally consumed in low quantities.</p> <p>Benthic habitats capable of supporting the principal bivalve and/or gastropod prey species of common scoter may be relatively extensive in area within the SPA and the prey distributions and abundance within suitable habitats will vary both spatially and temporally. However some areas within accessible foraging depths are likely to more consistently support relatively higher biomass of benthic prey. Common scoter is usually associated with sandy substrates, which support many of its bivalve prey with notable exception of blue mussel, which is found on rocky or stony substrates. Information on these locations is currently lacking for the Solway Firth SPA.</p> <p>The key supporting processes for common scoter at the Solway Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow. There is limited evidence that foraging is also influenced by tides, with one study in recording more feeding activity at high tide (Goudie & Ankney, 1986), and counts in Carmarthen Bay suggesting movement closer to shore at high tide (Banks <i>et al.</i> 2007). Though these movements are likely to relate to access to different feeding areas at different tidal stages, as another study showed that scoters fed preferentially in inshore waters at low tide when the seabed bottom is easier to reach (Kelly, 2005). Maintaining high water quality which support food resources for the species and avoid disease and toxin accumulations from the wider marine and terrestrial environments through the River basin Management Planning measures.</p>
Common goldeneye	<p>Maintain the extent and distribution of supporting habitats for common goldeneye within the site.</p> <p>and</p> <p>Ensure the variety and abundance of food resources and the condition of supporting habitats and associated</p>	<p>Goldeneyes require suitable habitat for foraging, loafing, roosting and other maintenance activities within this SPA. Goldeneyes use a range of freshwater, brackish and marine waters in the non-breeding season and are commonly associated with estuaries (Woodward & Humphreys, 2018). They feed predominantly during the day and have a preference for shallow waters, with their maximum dive depth being 6m (Sotheran <i>et al.</i> 2019). Goldeneyes do not appear to exhibit a particular preference for a single type of substrate.</p> <p>Maintain inter-tidal and subtidal habitats which support food resources, primarily bivalves which support the non-breeding population of goldeneye. It is important</p>

	<p>processes have the ability to recover.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>that there is no net loss of supporting habitat within natural parameters for the species and the food sources available. Access to freshwater habitats and shallower feeding areas within the estuaries which discharge to the Solway Firth SPA will be critical, especially in extreme weather events. They feed predominantly during the day and have a preference for shallow waters, with their maximum dive depth being 6m (Sotheran <i>et al.</i> 2019). Like other members of the Anatidae family, goldeneye may indirectly rely on seaweed due to the association of seaweed with benthic infauna (Orr, 2013).</p> <p>Goldeneyes take a wide variety of prey items, including: bivalves such as blue mussels, zebra mussels, gastropods (inc. <i>Bittium reticulatum</i> and <i>Rissoa membranacea</i>), crustaceans (including the shore crab), polychaetes, other invertebrates (e.g. chironomid larvae) and plant materials (Woodward & Humphreys, 2018).</p> <p>Benthic habitats capable of supporting the principal bivalve and/or gastropod prey species of goldeneye may be relatively extensive in area within the SPA and the prey distributions and abundance within suitable habitats will vary both spatially and temporally. However some areas within accessible foraging depths are likely to more consistently support relatively higher biomass of benthic prey. Information on these locations is currently lacking for the Solway Firth SPA.</p> <p>The key supporting processes for goldeneyes at the Solway Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow. Goldeneyes have previously been recorded feeding directly on sewage and industrial waste outfalls (Barrett & Barrett, 1985), suggesting that water with high levels of nutrients is still suitable. Goldeneye foraging activity has been recorded as being higher at low tide than other tidal states (Mudge & Allen, 1980). Roost flights have been recorded in darker twilight periods in mid-winter and colder temperatures (Sayler & Afton, 1981). Maintain high or good water quality which support food resources for the species and avoid disease and toxin accumulations from the wider marine and terrestrial environments through the River basin Management Planning measures.</p>
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<p>Goosander</p>	<p>Maintain the extent and distribution of supporting habitats for goosander within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Goosanders require suitable habitat for foraging, loafing, roosting and other maintenance activities within this SPA. Maintain the extent and distribution inter-tidal and subtidal habitats which support food resources, primarily fish in the favoured locations. Goosanders use estuaries, coastal lagoons and sheltered sea coasts, normally in waters of less than 10m deep (Scott & Rose, 1996). These will include the estuaries of the principle rivers which discharge to the Solway Firth SPA. A small-fish rich water column in the estuary, along with undisturbed freshwater waterbuses along the coasts for roosting and preening, are required.</p> <p>Goosanders are piscivores, predominately taking small to medium fish (around 4-12 cm in length) and only rarely taking invertebrate prey. Fish consumed in the marine and coastal environment include: gunnel, herring, cod, plaice, sandeel, goldskinny, blenny, eels, eelpout, sea scorpions, stickleback, gobies, sandsmelt, butterfish, cottids and roach (Cramp & Simmons, 2004; Marquiss & Carss, 1994). Prey size typically ranges from 5cm up to a maximum of 51cm (Marquiss & Carss, 1994). In the Solway Firth SPA, herring in particular are known to be a key prey resource for goosander using this site in the non-breeding period. They are most active in feeding early morning and evening (Cramp & Simmons, 2004).</p> <p>The supporting processes for goosanders at the Solway Firth SPA are not well known but may include water quality (nutrients and turbidity) and water flow. As goosanders are visual feeders it is likely they could be impacted by any increase in water turbidity where it would impede their foraging ability. Most fishing occurs for goosander in clear waters (Cramp & Simmons, 2004). It is necessary to maintain existing water quality which supports food resources for goosander and avoid disease and toxin accumulations from the wider marine and terrestrial environments through the River basin Management Planning measures.</p>
<p>Eurasian oystercatcher</p>	<p>Maintain the extent and distribution of supporting habitats for oystercatcher within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition</p>	<p>Oystercatchers use the inter-tidal and coastal areas of Solway Firth SPA for foraging and roosting.</p> <p>Oystercatchers feed upon the tidal mud and sandflats within the SPA when the tide is low, such as at Blackshaw Bank and Carsethorn. Mussel and cockle beds are also important foraging habitats. At high tide, oystercatcher roosts on areas of bare ground, mudflats and merse which offer unrestricted views of the surrounding area.</p>

	<p>of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Important roosts include Burgh Marsh, Westfield Marsh and RSPB Campfield Marsh.</p> <p>Mollusc bivalves are the predominant prey for this species, with large mussels (<i>Mytilus edulis</i>) and cockles (<i>Cerastoderma edule</i>) of particular importance. This species also probes into intertidal sediment to forage for intertidal worms, such as ragworm (<i>Hedesis diversicolor</i>). Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species.</p> <p>The natural hydrology and availability of freshwater upon the intertidal flats is important for oystercatchers foraging and loafing. Natural processes should be maintained. Maintain open and unobstructed terrain around nesting, roosting and feeding sites.</p>
Red knot	<p>Maintain the extent and distribution of supporting habitats for knot within the site.</p> <p>and</p> <p>Ensure the variety and abundance of food resources and the condition of supporting habitats and associated processes have the ability to recover.</p> <p>and</p> <p>Existing water quality should be maintained or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Knot use the inter-tidal and coastal areas of the Solway Firth SPA for foraging and roosting. Foraging habitats are on predominantly muddy or sandy substrates often close to key roosts. Knot may indirectly rely on seaweed for foraging requirements due to the association of seaweed with benthic infauna (Goodship & Furness, 2019).</p> <p>Knot forage in large flocks across the extensive intertidal mud and sandflats, mussel beds and rocky scars situated across the SPA. Mollusc bivalves are the predominant prey for this species, with mussels (<i>Mytilus edulis</i>), cockles (<i>Castroderma edule</i>) and tellins (<i>Limecola marina</i>) of particular importance. This species may also probe up to 4cm into the sediment to forage for intertidal worms. At low tide, knot at the Solway Firth SPA feed mostly on the mussel and cockle beds on the tidal mud and sandflats, but also forage on sandbanks and within the merse. At high tide, knot return to the merse to roost. Important roosting sites for knot include Moricambe Bay, Calvo Marsh and Grune Point. Knot feed on a number of inter-tidal invertebrates, especially molluscs (Cramp & Simmons, 2004).</p> <p>Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key, as for all wader species. The natural hydrology and availability of freshwater upon the intertidal flats is important for knot foraging and loafing. Natural processes should be maintained. High density of channels within the intertidal mudflats and saltmarsh is important for providing habitat complexity and abundant invertebrate</p>

		prey for this species. Vegetation sward height should be kept low at key roost sites to ensure the suitability for this species. Roosting areas should be kept free from obstructions which may impair line-of-sight for this species.
Northern lapwing	<p>Maintain, or where appropriate restore, the extent and distribution of supporting habitats for lapwing within the site.</p> <p>and</p> <p>Ensure the variety and abundance of food resources and the condition of supporting habitats and associated processes have the ability to recover.</p> <p>and</p> <p>Existing water quality should be maintained or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Lapwings use the inter-tidal and coastal areas of the Solway Firth SPA for roosting and foraging. Lapwings preferred foraging habitats include mud and sand, shingle and saltmarsh (including saltmarsh pools).</p> <p>Lapwings diet can consist of adult and larval insects (e.g. beetles, ants, Diptera, crickets, grasshoppers, dragonflies, mayflies, cicadas and Lepidoptera), spiders, snails, earthworms, frogs and seeds or other plant material (Urban <i>et al.</i> 1986; del Hoyo <i>et al.</i> 1996).</p> <p>Supporting processes for lapwing at the Solway Firth SPA are not well understood but may relate to nutrient movements flowing into and within the SPA and the subsequent effects this has on their prey habitat. Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species. As lapwing are a saltmarsh feeding species they need short open swards provided by grazing when feeding on the marshes.</p>
Golden plover	<p>Maintain the extent and distribution of supporting habitats for golden plover within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition</p>	<p>Golden plovers at the Solway Firth SPA will use the intertidal zone and habitats further inland for both foraging and roosting. Compared with other plover species, golden plovers inhabit a more terrestrial environment, although they are present at the coast during the nonbreeding season. Golden plovers tend to prefer open ground above foreshore as opposed to tidal flats of mud or sand (Snow & Perrins, 1998).</p> <p>The merse surrounding Moricambe Bay supports multiple important roost sites for golden plover, including Anthorn Marsh and Newton Marsh, which support 75% of</p>

	<p>of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>golden plover on the English side of the estuary. Calvo Marsh is also an important roost site.</p> <p>At the Solway Firth SPA golden plovers forage on the intertidal mudflats, merge, marshes, feeding predominately upon worms, insects and small molluscs. Most food is taken from the surface or by probing 1-2cm below the surface (Cramp & Simmons, 2004).</p> <p>They are vulnerable to loss of optimal foraging habitat and food resources as a result of changes to the mud and sand substrates and lower merge on which they preferentially feed. Maintain the distribution, abundance and availability of key food and prey items (eg. earthworm, leatherjackets, beetles, spiders) at preferred sizes.</p> <p>Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species. As golden plover are a saltmarsh feeding species they need short open swards provided by grazing when feeding on the marshes. Golden plover favour short vegetation when foraging for insects and worms</p> <p>Maintain water availability in feeding sites and maintain the area of soggy or flooded land overall.</p>
Grey plover	<p>Maintain, or where appropriate restore, the extent and distribution of supporting habitats for grey plover within the site.</p> <p>and</p> <p>Ensure the variety and abundance of food resources and the condition of supporting habitats and associated processes have the ability to recover.</p> <p>and</p>	<p>Grey plovers at the Solway Firth SPA will use the intertidal habitats and habitats further inland for both foraging and roosting.</p> <p>The grey plover wintering diet will consist of marine polychaete worms, molluscs and crustaceans (e.g. crabs, sand shrimps) buried in the sand or mud or on the surface, as well as insects or earthworms when on inland habitats (BirdLife International, 2020). Grey plovers may indirectly rely on seaweed for foraging requirements due to the association of seaweed with benthic infauna (Goodship & Furness, 2019).</p> <p>Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species.</p>

	Existing water quality should be maintained or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.	
Ringed plover	<p>Maintain the extent and distribution of supporting habitats for ringed plover within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Ringed plovers at the Solway Firth SPA use a mix of sand, mud, shingle and cobble substrates on which to feed, and have preferred roost locations above the high tide mark.</p> <p>Ringed plovers feed on small crustaceans, molluscs, polychaete worms, isopods, amphipods, insects (e.g. ants, beetles, flies and fly larvae) and millipedes (del Hoyo <i>et al.</i> 1996). Ringed plovers may indirectly rely on seaweed for foraging requirements due to the association of seaweed with benthic infauna (Goodship & Furness, 2019).</p> <p>Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species.</p>
Dunlin	<p>Maintain the extent and distribution of supporting habitats for dunlin within the site.</p> <p>and</p>	<p>Dunlins at the Solway Firth SPA favour muddy and sandy shores for feeding areas and those with mixed substrates of shingle and sand are used on the inner Solway. They will use routinely favoured high tide roosts at the site. Dunlin also have a strong association with the presence of seaweed, especially stranded supra-littoral and inter-tidal cast weed (Goodship & Furness, 2019).</p>

	<p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Dunlin are omnivorous during the non-breeding season, consuming mostly polychaete worms and small gastropods, as well as insects (dipteran flies and beetles), crustaceans, bivalves, plant matter and occasionally small fish (del Hoyo <i>et al.</i> 1996). They will also feed on amphipods from within seaweed (e.g <i>Enteromorpha</i> spp.) (Goodship & Furness, 2019).</p> <p>Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species.</p> <p>The supporting processes for dunlin at the Solway Firth SPA are not well known but may include water hydrology and tidal states. As with many wader species, dunlin foraging and roosting areas will be influenced by tidal states (Cramp & Simmons, 2004).</p>
Sanderling	<p>Maintain the extent and distribution of supporting habitats for sanderling within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Sanderlings at the Solway Firth SPA will use the intertidal habitats and coastal habitats for both foraging and roosting. Sanderlings are almost exclusively found on sandy feeding areas and traditional roosts. They tend to roost above the high-tide mark.</p> <p>During the winter sanderling diet consists of small molluscs, crustaceans, polychaete worms and adult, larval and pupal insects (e.g. Diptera, Coleoptera, Lepidoptera, Hemiptera and Hymenoptera), as well as occasionally fish and carrion (del Hoyo <i>et al.</i> 1996). Sanderlings regularly pick through seaweed wrack and this species showed a positive correlation with wrack cover on the beach (Orr, 2013). This species may indirectly rely on seaweed for foraging requirements due to the association of seaweed with benthic infauna (Goodship & Furness, 2019).</p> <p>Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species.</p>

<p>Common redshank</p>	<p>Maintain the extent and distribution of supporting habitats for redshank within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Redshanks use the Solway Firth SPA for foraging and roosting. Important feeding areas are on muddy substrates on the inner Solway and Wigtown Bay with high tide roosts on adjacent shingle areas. The merse can be an important feeding and roosting area on bigger tides.</p> <p>Redshanks feed upon the tidal mud and sandflats, and the rocky scars, within the SPA when the tide is low. At high tide, redshank roost in open areas which allow views of the surrounding area, and are located on the saltmarsh and tidal flats. Important redshank roosts include the shore between Browhouses and Powfoot, Westfield Marsh and the merse surrounding Moricambe Bay.</p> <p>Redshanks forage across the extensive mud and sandflats within the SPA. Redshank find their prey predominately by sight, searching for molluscs, crustaceans, worms and insects near the surface of the sediment, often within gullies and creeks. Small mud snails (<i>Hydrobia</i> spp.), small tellins (<i>Limecola balthica</i>) and amphipods (<i>Corophium</i> spp.) are important prey species. Redshank also forage for invertebrates within the merse, marshes and wet grasslands lining the estuary.</p> <p>Supporting processes for redshank at the Solway Firth SPA are not well understood but may relate to nutrient movements flowing into and within the SPA and the subsequent effects this has on their prey habitat. Natural hydrology across intertidal mudflats is important for the ecosystem to function. Natural processes should be maintained to ensure suitable foraging habitat for this species. There is currently no indication that the natural hydrology is being impacted. High density of channels within the intertidal mudflats and saltmarsh is important for providing habitat complexity and abundant invertebrate prey for this species. Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species.</p> <p>Redshanks require unobstructed views of the surrounding area when roosting, so to detect predators early. As a result, sufficient areas of bare ground or merse with low sward height is required by this species. In some areas, such as Caerlaverock National Nature Reserve, areas are grazed by cattle in late summer to achieve short sward vegetation. Maintain the availability of standing water of 1-5 cm deep.</p>
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		Redshank forage within areas of standing shallow water, situated within pools and creeks within the intertidal mudflats and saltmarsh at low tide. Suitable areas of shallow standing water should be maintained to ensure foraging habitat for this species.
Bar-tailed godwit	<p>Maintain the extent and distribution of supporting habitats for bar-tailed godwit within the site.</p> <p>and</p> <p>Ensure the variety and abundance of food resources and the condition of supporting habitats and associated processes have the ability to recover.</p> <p>and</p> <p>Existing water quality should be maintained or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Bar-tailed godwits favour both muddy and sandy substrates as feeding areas and use traditional roosts in the intertidal and inland area at the Solway Firth SPA. Maintain a vegetation structure of key roost sites dominated by bare ground or a short sparsely-vegetated sward.</p> <p>Bar-tailed godwits forage across the extensive intertidal mud and sandflats at low tide, but may also forage across rocky habitats, the merse and marshes. Bar-tailed godwits roost in areas with unobstructed views of the surrounding area, which includes the intertidal mudflats at Grune Point. Sheltered bays, free from disturbance, are thought to be favoured.</p> <p>In winter when feeding intertidally the bar-tailed godwit use their long bill to probe sediment and saltmarsh to catch worms and molluscs, including lugworm (<i>Arenicola marina</i>) and ragworm (<i>Hediste diversicolor</i>). The long bill of bar-tailed godwits allows them to forage for invertebrate prey buried deeper within the sediment. Bar-tailed godwits can also forage in shallow water. Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species.</p> <p>The natural hydrology and availability of freshwater upon the intertidal flats is important for bar-tailed godwit foraging and loafing. Natural processes should be maintained. High density of channels within the intertidal mudflats and saltmarsh is important for providing habitat complexity and abundant invertebrate prey for this species.</p>
Ruddy turnstone	<p>Maintain the extent and distribution of supporting habitats for turnstone within the site.</p> <p>and</p>	<p>Turnstones at the Solway Firth SPA almost exclusively use boulder, cobble and shingle substrates throughout the site for roosting and foraging. This restricts their distribution to key locations with small feeding flocks and roosts scattered across suitable habitat. Turnstones also have a strong association with the presence of seaweed (especially stranded supra-littoral and inter-tidal cast weed) and they use seaweed during the nonbreeding season by turning it over and rolling it up in order to feed on invertebrates living within it (Snow & Perrins, 1998).</p>

	<p>Ensure the variety and abundance of food resources and the condition of supporting habitats and associated processes have the ability to recover.</p> <p>and</p> <p>Existing water quality should be maintained or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>In the winter, turnstones diet consists of insects, crustaceans, molluscs (especially mussels or cockles), annelids, echinoderms, small fish, and carrion (BirdLife International, 2020).</p> <p>Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species.</p>
Eurasian curlew	<p>Maintain the extent and distribution of supporting habitats for curlew within the site.</p> <p>and</p> <p>Ensure the variety and abundance of food resources and the condition of supporting habitats and associated processes have the ability to recover.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting</p>	<p>Curlews use the Solway Firth SPA for foraging and roosting. Curlew use coastal habitats including tidal mudflats and sandflats as well as rocky and sandy beaches for foraging.</p> <p>At high tide, Curlew roost within the merse (saltmarsh), tidal flats and adjacent arable fields. Important curlew roots within the Solway Firth SPA include: Burgh Marsh, Anthorn Marsh, Newton Marsh and RSPB Campfield Marsh.</p> <p>Curlews forage upon the extensive tidal flats revealed at low tide, as well as the intertidal mussel beds, saltmarsh and marshland. Curlews may also forage within the surrounding agricultural land. When the tide is high, the merse becomes a key roost site.</p> <p>Curlew forage across a wide range of habitats within the SPA, including the intertidal mud and sandflats, merse, and mussel beds. The curlew uses its long decurved bill to probe within sediment and burrows to search for invertebrate prey, such as bivalves, worms and crabs. Its long bill allows curlew to reach deep buried prey, such as lugworms (<i>Arenicola marina</i>), which may be beyond the reach of other waders. Other important prey species include the bivalve <i>Limecola balthica</i>,</p>

	habitats and/or prey, should be avoided.	<p>ragworm (<i>Hediste diversicolor</i>) and the shore crab (<i>Carcinus maenas</i>). Maintaining undisturbed food-rich feeding resources and undisturbed roosts are key for all wader species.</p> <p>The natural hydrology and availability of freshwater upon the intertidal flats is important for curlew foraging and loafing. Natural processes should be maintained. High density of channels within the intertidal mudflats and saltmarsh is important for providing habitat complexity and abundant invertebrate prey for this species. Vegetation sward height should be kept low at key roost sites to ensure the suitability for this species. Roosting areas should be kept free from obstructions which may impair line-of-sight for this species.</p>
Great cormorant	<p>Maintain the extent and distribution of supporting habitats for cormorant within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Cormorants at the Solway Firth SPA utilise both the outer estuary and tributary estuaries of rivers discharging to the Solway Firth. They will utilise coastal habitats for foraging and most roosts are inland or on freshwater areas.</p> <p>Cormorants are predominantly piscivores, feeding on species such as sculpins, capelin, gadids, flatfish, and will also eat crustaceans, amphibians and molluscs (BirdLife International, 2020). When feeding within marine waters cormorants tend to feed on bottom-dwelling fish, though they may take shoaling fish in deeper waters (del Hoyo et al. 1992). Cormorants rarely dive below 10m, though they have been recorded diving as deeply as 35m (BirdLife International, 2020).</p> <p>Cormorants have been shown to select areas with sandy substrates, as these are the prey supporting habitats for flatfish, as well as rocky substrates, for prey such as wrasse, sea scorpions and small gadoids (BirdLife International, 2020).</p> <p>Information is lacking on the key supporting processes for cormorants at the Solway Firth SPA, but may relate to water quality (nutrients and turbidity) and water flow.</p>
Black-headed gull	Maintain the extent and distribution of supporting habitats for black-headed gull within the site.	Black-headed gulls require suitable habitat within the Solway Firth SPA for roosting. However, other activities such as loafing, foraging and other maintenance activities, will also take place within this SPA. Black-headed gulls will use the marine, coastal and intertidal waters in the Solway Firth SPA. They prefer sandy or muddy beaches

	<p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>and tend to avoid rocky or more exposed coasts. The surface canopy of kelp forests or drifting kelp mats may also possibly be used as resting/roosting sites (Goodship & Furness, 2019). When feeding in the marine environment they will surface plunge, occasionally fully submerging. When roosting, they prefer to do so in large flock, and will use marine and estuarine areas as their night-time roosts.</p> <p>Black-headed gulls are omnivorous and have a varied diet. Within the marine environment they will forage on marine invertebrates such as molluscs, crustacea and marine worms, and they may also take some small fish (del Hoyo <i>et al.</i> 1996). Black-headed gulls are also attracted to washed-up seaweed, probably to feed on sandhoppers and the larvae and adults of shore flies (Vernon, 1972) as well as other benthic infauna (Goodship & Furness, 2019). The prey supporting habitats within the marine environment for black-headed gull are not known.</p> <p>Information is lacking on the supporting processes for this species at the Solway Firth SPA, but may relate to water quality (nutrients and turbidity), tidal cycles, and water flow. As they feed in tidal areas, it is likely that tides may play a role in their foraging, particularly in the winter when they feed more coastally and in intertidal, inshore waters (Tasker, 2007).</p>
Common gull	<p>Maintain the extent and distribution of supporting habitats for common gull within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate</p>	<p>Common gulls require suitable habitat within the Solway Firth SPA primarily for roosting. However, other activities such as loafing, foraging and other maintenance activities, will also take place within this SPA. Common gulls will use the marine and coastal waters in the Solway Firth SPA. The surface canopy of kelp forests or drifting kelp mats may also possibly be used as resting/roosting sites.</p> <p>Common gulls are omnivorous and have a varied diet, and within the marine environment will feed on a mixture of insects, planktonic crustaceans, bivalves, polychaetes, molluscs and small fish (del Hoyo <i>et al.</i> 1996). Common gulls are also attracted to washed-up seaweed, probably to feed on sandhoppers and the larvae and adults of shore flies (Vernon, 1972).</p> <p>The key supporting processes for common gull at the Solway Firth SPA are not well known, but may include water quality (nutrients and turbidity), tidal cycles and water</p>

	<p>improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>flow. They appear to prefer areas with upwellings near surface waters, but as they also feed along tidelines (Vermeer & De Vito, 1987), the tide cycles may determine when they forage on shore versus within the marine waters.</p>
<p>Herring gull</p>	<p>Maintain the extent and distribution of supporting habitats for herring gull within the site.</p> <p>and</p> <p>Maintain the variety and abundance of food resources and the condition of supporting habitats and associated processes.</p> <p>and</p> <p>Existing water quality should be maintained, or where appropriate improved, and any increase in nutrients, turbidity or contaminants where this could reduce supporting habitats and/or prey, should be avoided.</p>	<p>Herring gulls require suitable habitat for foraging, roosting, loafing, and other maintenance activities within the Solway Firth SPA. Herring gulls feed both in the marine, coastal and terrestrial environments. Herring gulls feeding in the marine environment within this SPA will be largely feeding on the surface and scavenging, diving up to 2m for prey items.</p> <p>Herring gulls are highly opportunistic in what prey items they take. When foraging in the marine and coastal environment their prey will include fish, crabs, molluscs, starfish, marine worms and may also scavenge from fishing boats (del Hoyo <i>et al.</i> 1996). Herring gulls may also foraging within infralittoral reef kelp forests) to feed on benthic infauna (Kelly, 2005).</p> <p>Information is lacking on the supporting processes for herring gulls at the Solway Firth SPA, but may relate to water quality (nutrients and turbidity) and water flow.</p>

Annex 2: Supporting Information

Factors determining the potential for feature recovery.

Feature	Factors determining the potential for feature recovery
<p>Red-throated diver</p>	<p>Red-throated diver estimated generation length is 8.2 years, with the maximum longevity estimated as around 24 years (Bird <i>et al.</i> 2020). Age of first breeding is uncertain, but has been estimated as being 2.5 years (Bird <i>et al.</i> 2020). Clutch size is 2 (1-3) eggs (Cramp & Simmons, 2004) and Horswill & Robinson (2015) give national average productivity of 0.571 (± 0.222 SD). However, productivity is known to vary depending on region and on the year, from 0.13 (Orkney in 2017) to 0.91 (southern Finland). Horswill & Robinson (2015) give an estimated adult (3+years) survival rate of 0.840 (± 0.074 SE). Most mortality is thought to occur in the non-breeding season (Schmutz, 2014). Juvenile (0-1year) and immature (1-2 year) survival rates have been estimated as 0.600 and 0.620 (Horswill & Robinson, 2015). As for other species with apparently high adult survival rates, relatively large impacts on population trends may arise from changes to adult survival.</p> <p>Red-throated divers breeding in Scotland winter over a substantial area including both east and west coasts of Britain and Ireland (Okill, 1994). Birds from breeding grounds in Scandinavia and the Baltic states are thought to migrate mainly to the southern North Sea in winter (Wright <i>et al.</i>, 2012; O'Brien <i>et al.</i>, 2008); while birds from Greenland have been recovered in Scotland (Wernham <i>et al.</i> 2002). Recent tracking studies of wintering birds captured in the German North Sea indicate that individual birds exhibit high levels of consistency in migration routes, breeding, wintering & moulting areas (Kleinschmidt <i>et al.</i> 2017) which may limit individual ability to adapt to changes within wintering areas and hence potential for population recovery from perturbations.. Red-throated divers may be particularly sensitive to disturbance during their post-breeding flightless moult period, commencing sometime between late September and December (Cramp & Simmons, 2004).</p> <p>Pressures at terrestrial nesting grounds (e.g. pollution of inland breeding lakes, depredation by invasive mammalian predators (Furness, 2016)) or in wintering areas at sea (e.g. displacement from offshore wind farms) could limit the potential of populations to recover from impacts arising in marine foraging areas.</p>
<p>Whooper swan</p>	<p>Whooper swan estimated generation length is 9.7 years, with the maximum longevity estimated as around 28 years (Bird <i>et al.</i> 2020). Age of first breeding is 4 years (Bird <i>et al.</i> 2020). Clutch size is 4-5 eggs and productivity has been estimated as 0.168 (Robinson <i>et al.</i> 2004). They will only have one brood, and so do not have the ability to re-lay should something interrupt their breeding season. Estimated adult survival rate is between 0.80-0.85 (Bird <i>et al.</i> 2020; Robinson, 2005). As for other species with apparently high adult survival rates, relatively large impacts on population trends may arise from changes to adult survival.</p> <p>Whooper swans wintering in Scotland come predominantly from the Icelandic breeding population. Pressures at their breeding grounds or during migration may have subsequent effects on the wintering</p>

	<p>population. For example, swans can be susceptible to poor weather and strong winds during migration.</p> <p>Whooper swans are site faithful which may limit individual ability to adapt to changes within these areas and hence potential for population recovery from perturbations.</p> <p>Whooper swans rely on being able to travel safely between roosting areas and feeding areas during winter. It means that should impacts on their inland feeding sites occur it could have a subsequent effect on their wintering population at their roosting site, and vice versa. Disturbance to feeding or roosting during non-breeding period may reduce fitness and have consequences for the subsequent migration back to their breeding grounds.</p>
<p>Barnacle goose</p>	<p>Barnacle goose estimated generation length is 10 years, with the maximum longevity estimated as around 33 years (Bird <i>et al.</i> 2020). Age of first breeding is 3 years (Bird <i>et al.</i> 2020). The peak in breeding success occurs after the age of 10-11 years (Jensen <i>et al.</i> 2018). Clutch size is 4-5 eggs (Robinson, 2005) with a mean brood size of 1.7 goslings and average productivity at Solway Firth is 0.06, which is very low (Griffin, 2019). They will only have one brood, and so do not have the ability to re-lay should something interrupt their breeding season. Survival of the young in the first six months is known to be vastly reduced for a number of reasons including predation at the breeding grounds, harsh weather conditions and energetically demanding migration to wintering grounds (Jensen <i>et al.</i> 2018). Estimated adult survival rate is between 0.88-0.91 (Bird <i>et al.</i> 2020; Robinson, 2005). As for other species with apparently high adult survival rates, relatively large impacts on population trends may arise from changes to adult survival.</p> <p>Localisation of the entire wintering population of Svalbard barnacle goose population at the Solway Firth SPA makes their population vulnerable should an event occur at the site to impact on their mortality such as, avian flu in winter 2012/22. They are highly site faithful. Pressures at breeding grounds or during migration may have subsequent effects on the wintering population.</p> <p>Barnacle geese rely on being able to travel safely between roosting areas and feeding areas during winter. It means that should impacts on their inland feeding sites occur it could have a subsequent effect on their wintering population at their roosting site, and vice versa. Disturbance to feeding or roosting during non-breeding period may reduce fitness and have consequences for the subsequent migration back to their breeding grounds.</p>
<p>Pink-footed goose</p>	<p>Pink-footed goose estimated generation length is 11.7 years and maximum longevity is around 34 years (Bird <i>et al.</i> 2020), although average lifespan is recorded as being 8 years. Shooting in autumn and winter accounts for the majority of mortality in pink-footed geese and may be influencing this average lifespan figure. Females first breed at 3 years with a clutch size typically of 4-5 eggs. They will only have one brood, and so do not have the ability to re-lay should something interrupt their breeding season. Adult survival rate has been recorded as 0.81 with juvenile survival recorded as 0.78. As for other species with apparently high adult survival rates, relatively large impacts on population trends may arise from changes to adult survival.</p>

	<p>Pressures at their breeding grounds in Iceland or Greenland, or during their migration may have subsequent effects on the wintering population.</p> <p>Pink-footed geese rely on being able to travel safely between roosting areas and feeding areas during winter. It means that should impacts on their inland feeding sites occur it could have a subsequent effect on their wintering population at their roosting site, and vice versa. Disturbance to feeding or roosting during non-breeding period may reduce fitness and have consequences for the subsequent migration back to their breeding grounds.</p>
Shelduck	<p>Shelduck estimated generation length is 8.1 years, with a maximum longevity of 25 years (Bird <i>et al.</i> 2020). Age at first breeding is 3 years old (Bird <i>et al.</i> 2020). Average clutch size is 9 eggs (Forrester <i>et al.</i> 2012) and average productivity is around 1 chick fledged, which suggests that many ducklings that hatch are predated or do not survive for other reasons. Replacement clutches may be laid but only if first clutch loss occurs in early incubation (Cramp & Simmons, 2004). Adult survival rate is 0.80 (Bird <i>et al.</i> 2020).</p> <p>Pressures at their breeding grounds (e.g. unsuitable habitat for breeding or pollution) in Scotland or beyond in other parts of Europe, may have subsequent effects on the wintering population. Pressures at their moulting areas (e.g. oil pollution) in the Waddensea or UK waters could also have a subsequent effect on the breeding and wintering populations within Scotland.</p> <p>Shelduck undergo a flightless moult period for around 4 weeks between July and October (Cramp & Simmons, 2004). They will be particularly vulnerable during this period.</p> <p>Shelduck exhibit high site fidelity which may limit individual ability to adapt to changes within their breeding or wintering areas, and hence potential for population recovery from perturbations.</p>
Teal	<p>Teal estimated generation length is 3.9 years, with a maximum longevity of 21 years (Bird <i>et al.</i> 2020). Age at first breeding is 1 year old (Bird <i>et al.</i> 2020). Clutch size is 8-11 eggs and failed clutches can be replaced if it occurs early enough in incubation (Forrester <i>et al.</i> 2012). Average productivity is not well known due but the limited studies that have occurred show that there is low survival of young (Forrester <i>et al.</i> 2012). Should egg loss occur early on in first clutch a replacement clutch may be laid (Cramp & Simmons, 2004). Adult survival rate is 0.53 (Bird <i>et al.</i> 2020), which is lower than some other duck species.</p> <p>Pressures at their breeding grounds in the (e.g. unsuitable habitat or pollution) in Scotland or beyond in other parts of northern Europe or Fennoscandia, may have subsequent effects on the wintering population. During their post-breeding season moult teal will become much less mobile so any disturbance during this particularly sensitive time period could have an effect on their subsequent winter survival.</p> <p>Teal can be susceptible to cold weather events, which may impact on where they can feed and therefore can have an effect on survival over winter.</p>

	<p>As teal are sensitive to disturbance, any disturbance to feeding or roosting during non-breeding period may reduce fitness and have consequences for the subsequent migration back to their breeding grounds.</p> <p>Teal undergo a flightless moult period for around 4 weeks between July and August (Cramp & Simmons, 2004). They will be particularly vulnerable during this period.</p> <p>Although teal are omnivores, they do have specific habitat requirements for foraging and generally only take food up to a certain size (Cramp & Simmons, 2005). This means should the habitat not have items of a small enough size this could limit the potential for teal to use the area.</p>
Pintail	<p>Pintail estimated generation length is 4.9 years, with a maximum longevity of 27 years (Bird <i>et al.</i> 2020). Age at first breeding is 1 year old (Bird <i>et al.</i> 2020). Clutch size is 7-9 eggs and average productivity is estimated as 0.16 young per female, per nesting season. This is a low productivity value (Flint <i>et al.</i> 1998) and may relate to the fact the ducklings are very vulnerable to predation. The duckling stage is a particularly vulnerable life cycle stage for pintails and losses can be large. Adult survival rate is around 0.68 (Bird <i>et al.</i> 2020), with male survival being higher than female survival (Robinson, 2005).</p> <p>Pressures at their breeding grounds in the (e.g. unsuitable habitat or pollution) outwith the UK, or during their migration may have subsequent effects on the wintering population. Breeding pintail have very specific breeding habitat requirements which are shallow pools in open grassland areas (Robinson, 2005). If their habitat requirements are not met poor breeding seasons could result in reduced recruitment into the population, which could have a subsequent effect on the wintering population coming to Scotland.</p> <p>As a dabbling duck pintail largely rely on their food being within the top 30cm of water (Cramp & Simmons, 2004). Body condition may be reduced should they not be able to reach the food they need when on estuaries.</p> <p>Pairs may winter together (Cramp & Simmons, 2004), thus any negative effects on pairs within the winter population could have an effect on the following breeding season.</p>
Shoveler	<p>Shoveler estimated generation length is 4.1 years, with a maximum longevity of 23 years (Bird <i>et al.</i> 2020). Age at first breeding is 1 year old (Bird <i>et al.</i> 2020). Clutch size is 9-11 eggs. They can lay a replacement clutch should the first clutch fail early in the incubation period. Juvenile survival in the first year is 0.380 (Robinson, 2005). Adult survival rate is 0.59 (Bird <i>et al.</i> 2020), which is lower than some other duck species.</p> <p>Shovelers have quite a wide ranging diet which means they may be able to adapt to a change in food supply should it occur.</p> <p>Pressures at their breeding or moulting grounds (e.g. unsuitable habitat, disturbance, or pollution etc.), or during their migration, may have subsequent effects on the wintering population. Shoveler undergo a flightless moult period for around 4 weeks between June and September</p>

	(Cramp & Simmons, 2004). They will be particularly vulnerable during this period.
Greater scaup	<p>Estimated generation length is 4.1 years, which appears fairly short for a seaduck, and they have a maximum known longevity of 22 years (Bird <i>et al.</i> 2020). Age of first breeding is uncertain but thought to be 1-2 years (Bird <i>et al.</i> 2020). Clutch size is 8-11 (6-15) eggs and birds may relay following egg loss (Cramp & Simmons, 2004). Horswill & Robinson (2015) give a mean productivity of 0.570 (\pm 0.120). Adult survival is estimated as 0.74 (Bird <i>et al.</i> 2020) with juvenile (0-1 years) survival estimated as 0.40 (Horswill & Robinson, 2015). Annual mortality among adult birds ringed in Iceland was 52% (Boyd 1962), which appears to be quite high.</p> <p>Scaup wintering in Britain and Ireland are derived mainly from the (small) Icelandic breeding population (Wright <i>et al.</i> 2012; Balmer <i>et al.</i> 2014). During severe winters large numbers of birds arrive in the UK from the Baltic (Salmon, 1988). Pressures in their breeding grounds (e.g. particularly susceptible to nests being flooded) could limit potential for populations to recover from impacts arising in wintering areas.</p> <p>Scaup are highly gregarious outside of the breeding season and are commonly observed in small or large flocks sometimes of several thousand individuals. This may mean that if a disturbance was to occur within their flock that a large number of individuals could potentially be affected. Their nocturnal feeding habits and potential use of daytime onshore roosts may make it vulnerable to some types of disturbance of less relevant to diurnal foragers. Scaup appears to be relatively adaptable and able to consume a range of different prey groups when they are available, which may lessen potential impacts of localised prey or habitat loss.</p>
Common scoter	<p>Estimated generation length is 5.3 years, which appears fairly short for a seaduck, and they have a maximum known longevity of 18 years (Bird <i>et al.</i> 2020). Age of first breeding is 2 years (Bird <i>et al.</i> 2020). They have a clutch size is 6-8 (5-11) eggs and birds may relay following egg loss (Cramp & Simmons, 2004). Horswill & Robinson (2015) cite an estimated productivity of 1.838 (\pm1.184 SD), which appears quite a low productivity. Adult survival rate has been estimated as being 0.78 (Bird <i>et al.</i> 2020). The annual mortality among adult birds ringed in Iceland was estimated at 23% (Cramp & Simmons, 2004). Common scoter population stability is likely to be related to a high levels of adult survival, and any pressure on adult survival would quickly have an adverse effect on population numbers. Evidence exists that they have the ability to recover their populations following acute events (e.g. oil spill events, see Banks <i>et al.</i> 2007).</p> <p>Common scoter exhibit complex migratory behaviour between breeding, moulting and wintering grounds, but the GB wintering population appears to be derived mainly from Scandanavian and Icelandic breeding populations (Wernham <i>et al.</i> 2002). Pressures in these breeding grounds could limit potential for populations to recover from impacts arising in wintering areas. Common scoter is highly gregarious outside of the breeding season and is commonly observed in large dense flocks of thousands or even tens of thousands of individuals. This may mean that if a disturbance was to occur within their flock that a large number of individuals could potentially be affected. Adults become flightless for</p>

	<p>several weeks during their wing moult and may be particularly susceptible to disturbance or pollution at this time.</p>
Goldeneye	<p>Estimated generation length is 7.1 years and they have a maximum known longevity of around 20 years (Bird <i>et al.</i> 2020). Age of first breeding is 3 years (Bird <i>et al.</i> 2020) with a clutch size of 8-11 (5-13) eggs (Cramp & Simmons, 2004). Breeding success is difficult to assess as young leave nest holes shortly after hatching. Horswill & Robinson (2015) give an estimate of 0.365 chicks fledged per pair per annum. Baldassarre (2014) characterises brood survival as low, but variable with geographic location and year. Adult survival rates range from 0.65 (Bird <i>et al.</i> 2020) to 0.83 (Balmer & Peach, 1997).</p> <p>Goldeneye utilise a range of shallow (up to c.6m) freshwater, brackish and marine habitats in the non-breeding season and also appear able to utilise a wide range of small prey items, including both animal and plant materials (Cramp & Simmons, 2004; Woodward & Humphreys, 2018). This may enable them to utilise alternative wintering areas in event of localised habitat loss or displacement.</p> <p>Goldeneye wintering in GB are thought to come mainly from the Scandinavian breeding population (Wright <i>et al.</i> 2012). Pressures in their breeding grounds (e.g. wetland degradation, acid rain, loss of natural nesting habitat in old and decaying trees with potential nest holes) could limit potential for populations to recover from impacts arising in wintering areas (BirdLife International, 2019).</p>
Goosander	<p>Goosander have an estimated generation length of 5.1 years and they have a maximum known longevity of around 18 years (Bird <i>et al.</i> 2020). Age of first breeding is 2 years (Bird <i>et al.</i> 2020) with a clutch size of 11 eggs (Robinson, 2005). Adult survival is estimated as 0.60 (Bird <i>et al.</i> 2020).</p> <p>After their summer breeding period they then have a flightless moult period for around 4 weeks between July and September, during which they are particularly vulnerable to predation. They also require open water with abundant fish populations during this time (Forrester <i>et al.</i> 2012).</p> <p>Whilst goosanders can take a variety of prey the prey must be small enough for them to be able to swallow. This means they rely on there being enough prey of a suitable size in order to maintain body condition and breed, and then survive the winter period. Goosanders can also be affected by the cold weather, such that if ice forms on the water bodies they are using, they must travel elsewhere in order to be able to forage (Forrester <i>et al.</i> 2012). Goosanders also feed predominantly by sight (Cramp & Simmons, 2004) and so tend to require clear water to do so successfully.</p> <p>Goosander often form communal roosts and any disturbance of these roosts could impact on their energetics and hence survival.</p> <p>Pressures such as licensed control, that occur inland and on freshwater environments, could have subsequent effects on their wintering populations at their estuarine and marine sites. Other pressures during their breeding period, for example availability of suitable nest cavities</p>

	and suitable prey items for the young and adults, can also have subsequent effects on the numbers wintering in Scotland.
Oystercatcher	<p>Oystercatcher estimated generation length is 13.3 years, with a maximum longevity of 43 years (Bird <i>et al.</i> 2020). Age at first breeding is 4 years old (Bird <i>et al.</i> 2020). Clutch size is 2-3 eggs (Robinson, 2005). Juvenile survival is estimated as being 0.390 (Robinson, 2005). Adult survival rate is 0.89 (Bird <i>et al.</i> 2020). As for other species with apparently high adult survival rates, relatively large impacts on population trends may arise from changes to adult survival.</p> <p>Pressures that occur at the oystercatchers breeding grounds could limit potential for populations to recover from impacts arising in wintering areas.</p> <p>Oystercatchers have particular sensitivities at their high tide roost sites and any pressures which disturb their roosting could have effects on their winter survival and subsequent breeding season.</p> <p>Oystercatchers have quite a wide prey base, be this at the coast or in more inland foraging habitats. This suggests they may have some ability to adapt should a particular prey resource become unavailable to them.</p> <p>Oystercatchers exhibit high site fidelity which may limit individual ability to adapt to changes within their breeding or wintering areas, and hence potential for population recovery from perturbations. Periods of cold weather are known to have potential impacts on oystercatcher survival (Cramp & Simmons, 2004).</p>
Lapwing	<p>Lapwings have a generation length of 6.2 years and a maximum longevity of 24 years (Bird <i>et al.</i> 2020). Females first breed at 2 years old. Adult survival rate is 0.79 (Bird <i>et al.</i> 2020). Short-term cold weather impacts reduces adult survival in lapwings. Productivity varies depending on the study colony, but productivity of 0.46 fledglings per pair is not unusual, which is low. Poor and reduced breeding attempts due to agricultural intensification, predation and chick mortality are thought to be the main causes of poor lapwing productivity, and therefore of population decline.</p> <p>Pressures at breeding grounds, or during their migration if coming from the Fennoscandia population to Scotland, may have subsequent effects on the wintering population. This is coupled with short-term cold weather impacts reducing adult survival.</p> <p>Lapwings exhibit high site fidelity, which may limit individual ability to adapt to changes within wintering areas and hence potential for population recovery from perturbations.</p> <p>Lapwings are sensitive to disturbance and so disturbance and possible subsequent displacement from roosts due to recreational activities may reduce winter survival and subsequent fitness to breed.</p>
Golden plover	<p>Golden plover estimated generation length is 4.5 years, with a maximum longevity of 17 years (Bird <i>et al.</i> 2020). Age at first breeding is 1 year old (Bird <i>et al.</i> 2020). Clutch size is 4 eggs and they have one brood a year (Robinson, 2005). Replacement clutch may be laid if first clutch lost early on in incubation period (Cramp & Simmons, 2005). Adult survival rate is</p>

	<p>0.77 (Bird <i>et al.</i> 2020). Golden plovers are particularly impacted by short-term cold weather, which can reduce adult survival.</p> <p>Golden plovers exhibit high site fidelity, which may limit individual ability to adapt to changes within wintering areas and hence potential for population recovery from perturbations.</p> <p>Wintering golden plover are likely to be made up of breeding birds from Iceland, Faroe Islands, and UK breeding populations. Pressures at their breeding grounds may have subsequent effects on the wintering population.</p> <p>When roosting, golden plovers tend to flock together for safety (Cramp & Simmons, 2004). Golden plovers are sensitive to disturbance and so disturbance and possible subsequent displacement from their roosts due to e.g. recreational activities may reduce winter survival and subsequent fitness to breed.</p>
Grey plover	<p>Grey plover estimated generation length is 7.6 years, with a maximum longevity of 26 years (Bird <i>et al.</i> 2020). Age at first breeding is 2 years old (Bird <i>et al.</i> 2020). Clutch size is 4 eggs and they will only have one clutch per season (Robinson, 2005). Juvenile survival in their first year is 0.63 (Robinson, 2005). Adult survival rate is 0.86 (Bird <i>et al.</i> 2020). As for other species with apparently high adult survival rates, relatively large impacts on population trends may arise from changes to adult survival.</p> <p>Grey plovers are particularly impacted by short-term cold weather, which can reduce adult survival.</p> <p>Grey plovers are a migratory species which breed in the High Arctic. Pressures at their breeding grounds, or during their migration, may have subsequent effects on the wintering population. Grey plovers exhibit site fidelity, which may limit individual ability to adapt to changes within wintering areas and hence potential for population recovery from perturbations.</p> <p>Grey plovers are sensitive to disturbance and so disturbance and possible subsequent displacement from roosts due to recreational activities may reduce winter survival and subsequent fitness to breed.</p>
Ringed plover	<p>Ringed plovers estimated generation length is 3.9 years, with a maximum longevity of 21 years (Bird <i>et al.</i> 2020). Age at first breeding is 1 year old (Bird <i>et al.</i> 2020). Clutch size is 3-4 eggs and can have 2 broods per season (Cramp & Simmons, 2004), which may buffer them slightly to pressures during the breeding season. However, complete nest failure is quite common and may be due to predation, flooding or desertion (Cramp & Simmons, 2004). Adult survival rate is 0.74 (Bird <i>et al.</i> 2020).</p> <p>Ringed plovers are resident in GB but numbers in GB are augmented during spring and autumn passage as well as wintering populations arriving. Pressures at their breeding grounds, or during their migration, may have subsequent effects on the wintering population.</p> <p>Ringed plovers are sensitive to disturbance and so disturbance and possible subsequent displacement from roosts due to recreational</p>

	<p>activities may reduce winter survival and subsequent fitness to breed, particularly if the disturbance occurs during peak spring passage.</p>
Knot	<p>Knots estimated generation length is 6.9 years, with a maximum longevity of 27 years (Bird <i>et al.</i> 2020). Age at first breeding is 2 years old (Bird <i>et al.</i> 2020). Clutch size is 3-4 eggs and they only have one brood per breeding season (Cramp & Simmons, 2004). The fact they are not able to lay a replacement means their population may take longer to recover from breeding season losses and poor breeding successes. Adult survival rate is 0.80 (Bird <i>et al.</i> 2020).</p> <p>As knots have a bill length of up to 4cm, they will rely on their being sufficient food in the top few centimetres of soft substrates when probing for their food. Should there not be sufficient prey resource this will have subsequent effects on their winter survival and subsequent breeding season.</p> <p>Wintering knot on the Solway Firth SPA originate from breeding populations in Arctic North America, Greenland and Siberia. Pressures at their breeding grounds or during migration may have subsequent effects on the wintering population.</p> <p>When roosting, knot tend to flock together in large numbers for safety (Cramp & Simmons, 2004). Knots are sensitive to disturbance and so disturbance and possible subsequent displacement from their roosts due to e.g. recreational activities may reduce winter survival and subsequent fitness to breed.</p>
Dunlin	<p>Dunlins estimated generation length is 7.2 years, with a maximum longevity of 29 years (Bird <i>et al.</i> 2020). Age at first breeding is 2 years old (Bird <i>et al.</i> 2020). Clutch size is 4 eggs and they may be able to lay a second clutch should the first one fail early on (Robinson, 2005). Juvenile survival in the first year is 0.740 (Robinson, 2005). Adult survival rate is 0.76 (Bird <i>et al.</i> 2020).</p> <p>The wintering population of dunlin at the Solway Firth SPA is made up of birds breeding in Greenland, Iceland, Scandinavia and Russia. Pressures at their breeding grounds or during migration may have subsequent effects on the wintering population.</p> <p>When roosting, dunlin tend to flock together for safety (Cramp & Simmons, 2004). Dunlin are sensitive to disturbance and so disturbance and possible subsequent displacement from roosts due to recreational activities may reduce winter survival and subsequent fitness to breed.</p>
Sanderling	<p>Sanderlings estimated generation length is 6.4 years, with a maximum longevity of 19 years (Bird <i>et al.</i> 2020). Age at first breeding is 2 years old (Bird <i>et al.</i> 2020). Clutch size is 4 eggs and they only have one brood per breeding season. The fact they are not able to lay a replacement means their population may take longer to recover from breeding season losses and poor breeding successes. Adult survival rate is 0.84 (Bird <i>et al.</i> 2020). As for other species with apparently high adult survival rates, relatively large impacts on population trends may arise from changes to adult survival.</p> <p>The wintering population of sanderling at the Solway Firth SPA is made up of birds breeding in Siberia and Greenland. Pressures at their</p>

	<p>breeding grounds or during migration may have subsequent effects on the wintering population.</p> <p>When roosting, sanderling tend to flock together for safety (Cramp & Simmons, 2004). Sanderling are sensitive to disturbance and so disturbance and possible subsequent displacement from roosts due to recreational activities may reduce winter survival and subsequent fitness to breed, particularly if the disturbance occurs during peak spring passage. survival and fitness to breed particularly at peak spring passage.</p>
Redshank	<p>Redshank have a generation length of 5 years and a maximum longevity of 27 years (Bird <i>et al.</i> 2020). Age at first breeding is 1 (Bird <i>et al.</i> 2020). Clutch size is 4 (3-5) eggs and they will only have one brood (Cramp & Simmons, 2004). The fact they are not able to lay a replacement means there population may take longer to recover from breeding season losses and poor breeding successes. Adult survival rate is estimated as 0.79 (Bird <i>et al.</i> 2020) with juvenile (first year) survival estimated as 0.43 (Robinson, 2005).</p> <p>Pressures at breeding grounds, or during their migration if coming to their Scottish wintering grounds from a non-local population, may have subsequent effects on the wintering population.</p> <p>Redshank are sensitive to disturbance and so disturbance and possible subsequent displacement from roosts or foraging areas due to recreational activities may reduce winter survival and subsequent fitness to breed.</p>
Bar-tailed godwit	<p>Bar-tailed godwits estimated generation length is 8.4 years, with a maximum longevity of 34 years (Bird <i>et al.</i> 2020). Age at first breeding is 2 years old (Bird <i>et al.</i> 2020). Clutch size is 2-4 eggs and they only have one brood per breeding season (Cramp & Simmons, 2004). The fact they are not able to lay a replacement means there population may take longer to recover from breeding season losses and poor breeding successes. Adult survival rate is 0.86 (Bird <i>et al.</i> 2020). As for other species with apparently high adult survival rates, relatively large impacts on population trends may arise from changes to adult survival.</p> <p>Bar-tailed godwits breed in the Arctic of Scandinavia and Siberia. Pressures at their breeding grounds or during migration may have subsequent effects on the wintering population.</p> <p>The long bill of bar-tailed godwits allows them to forage for invertebrate prey buried deeper within the sediment compared to some other wader species. However, this still relies on there being enough suitable prey items and in having undisturbed foraging grounds.</p> <p>Bar-tailed godwit are sensitive to disturbance and so disturbance and possible subsequent displacement from roosts due to recreational activities may reduce winter survival and subsequent fitness to breed.</p>
Ruddy turnstone	<p>Turnstones estimated generation length is 6.2 years, with a maximum longevity of 22 years (Bird <i>et al.</i> 2020). Age at first breeding is 2 years old (Bird <i>et al.</i> 2020). Clutch size is 4 eggs and they may be able to lay replacement clutches should loss of first clutch occur early in the incubation period (Cramp & Simmons, 2004). Breeding success is not</p>

	<p>well known but studies have shown a high degree of chick loss (Cramp & Simmons, 2004), so productivity is likely to be low. Adult survival rate is 0.82 (Bird <i>et al.</i> 2020). As for other species with apparently high adult survival rates, relatively large impacts on population trends may arise from changes to adult survival.</p> <p>Turnstones breed in northern Europe as well as in Canada and Greenland. Pressures at their breeding grounds or during migration may have subsequent effects on the wintering population.</p> <p>Turnstones can use a variety of habitats on which to feed, for example shingle, cobble, and rocky shores, and can take a number of different prey items. Thus, as an adaptable species they may be able to cope to some changes should they occur in the inter-tidal habitat.</p>
Curlew	<p>Curlews estimated generation length is 9.5 years, with a maximum longevity of 32 years (Bird <i>et al.</i> 2020). Age at first breeding is 2-3 years old (Bird <i>et al.</i> 2020). Clutch size is 4 eggs (2-5) and they may be able to lay replacement clutches should loss of first clutch occur early in the incubation period (Cramp & Simmons, 2004). Juvenile survival in their first year is 0.470 (Robinson, 2005). Adult survival rate is 0.84 (Bird <i>et al.</i> 2020). As a long-lived species with high adult survival, any effect on adult mortality can potentially have serious effects on breeding numbers.</p> <p>Pressures at their breeding grounds (e.g. habitat changes) or during their migration to Scotland, for those coming from Scandinavia, may have subsequent effects on the wintering population.</p> <p>When roosting, curlews tend to flock together (Cramp & Simmons, 2004). Curlews are sensitive to disturbance and so disturbance and possible subsequent displacement from roosts due to e.g. recreational activities may reduce winter survival and subsequent fitness to breed.</p>
Cormorant	<p>Cormorants estimated generation length is 8.7 years, with a maximum longevity of 27 years (Bird <i>et al.</i> 2020). Age at first breeding is 3 years old (Bird <i>et al.</i> 2020). Clutch size is 3-4 eggs (Cramp & Simmons, 2004). Adult survival rate is 0.81 (Bird <i>et al.</i> 2020) and juvenile survival in the first year is 0.580 (Robinson, 2005). As a long-lived species with high adult survival, any effect on adult mortality can potentially have serious effects on breeding numbers.</p> <p>Pressures such as licensed control, that occur inland and on freshwater environments, could have subsequent effects on their wintering populations at their estuarine and marine sites. Other pressures during their breeding period can also have subsequent effects on the numbers wintering in Scotland.</p> <p>Cormorants will have two kinds of roosts: one diurnal haul-out spots for resting, digesting or wing-drying; and nocturnal roosts, which can contain a large number of individuals. Disturbance to either of these kinds of roosts could impact upon body condition and subsequent survival.</p> <p>Cormorant plumage requires a 'wing-drying' process after foraging/diving, as their feathers are not fully water-repellent. The amount of time required for 'wing drying' will depend on the weather conditions and how long they were foraging.</p>

<p>Black-headed gull</p>	<p>Estimated generation length is 9.8 years, similar to other gull species, with a maximum known longevity of 32 years (Bird <i>et al.</i> 2020). Age of first breeding is around 2 years old (Horswill & Robinson, 2015) with a clutch size of 2-3 (Cramp & Simmons, 2004). Adult survival is estimated to be between 0.825-0.86 and average productivity 0.625 (Bird <i>et al.</i> 2020; Horswill & Robinson, 2015). Any effect on adult mortality can potentially have serious effects on breeding numbers.</p> <p>This species has an extremely large range and breeds from Spain, France, UK, Iceland and Norway eastwards across Europe and Asia to the Pacific coast. Small numbers breed on the east coast of North America. Birds breeding on the coast of Europe are largely sedentary in winter but other populations tend to migrate. In Scotland, overwintering birds are most commonly found on the east and south-west coasts. Some Scottish breeding birds winter in England and Ireland. An influx of wintering birds move into western Europe with others reaching coastal equatorial Africa, Arabia, the Indian sub-continent, south-east Asia and the east coast of North America. Pressures in their breeding grounds (e.g. human disturbance and pollution of inland breeding sites) could limit potential for populations to recover from impacts arising in wintering areas (Tasker, 2007).</p> <p>As part of their foraging strategy relies on artificial food sources, it is possible that if these were to reduce it could have an impact on black-headed gull populations. However, they have such a wide diet they are likely to have the ability to adapt to changing circumstances in prey.</p>
<p>Common gull</p>	<p>Estimated generation length is 10.7 years, similar to other gull species, with a maximum known longevity of around 34 years (Bird <i>et al.</i> 2020). Clutch size is 3 (2-5) (Cramp & Simmons, 2004), and more than one clutch may be re-laid in season if the first clutch is lost. Adult survival has been estimated to be between 0.828-0.897 and average productivity as 0.543 (Bird <i>et al.</i> 2020; Horswill & Robinson 2015). A decline in fitness from around 10 years old has been noted (Brommer <i>et al.</i> 2010). Any effect on adult mortality can potentially have serious effects on breeding numbers.</p> <p>Pressures in their breeding grounds (e.g. human disturbance and pollution of inland breeding sites) could limit potential for populations to recover from impacts arising in wintering areas. Wintering populations of common gulls will originate from several breeding colonies (Horswill & Robinson, 2015).</p> <p>Survival of first time breeders is lower during cold winters compared to normal and warm winters (Horswill & Robinson, 2015). For older birds (>5 breeding years), survival of males appeared to be slightly higher than for females, but this could reflect lower site fidelity in females (Horswill & Robinson 2015)</p>
<p>Herring gull</p>	<p>Estimated generation length is 14 years, which is longer than other gull species, with a maximum known longevity of around 35 years (Bird <i>et al.</i> 2020). Age of first breeding is around 5 years old (Horswill & Robinson, 2015). Clutch size is 3 (2-4) eggs (Cramp & Simmons, 2004). Herring gulls have the ability to lay more than one clutch if the first one has been destroyed, but it depends on the female's physiological condition and replacement clutches will often have smaller or fewer eggs than the first clutch. Incubation takes 28-30 days (from mid-April), chick rearing takes</p>

35-40 days (Cramp & Simmons, 2004). Herring gulls are long-lived species, with an age of 49 having been recorded. Adult survival rates have been estimated to be between 0.83-0.89 (Bird *et al.* 2020; Horswill & Robinson, 2015), though lower survival rates have been estimated for urban nesting herring gulls (Rock & Vaughan, 2013). Any effect on adult mortality can potentially have serious effects on breeding numbers. As a long-lived seabird species, the adult will balance parental investment into their current breeding attempt with their own need to survive, and future reproductive attempts.

Northern breeding populations of this species are migratory (del Hoyo *et al.* 1996) although populations in the south are nomadic or completely non-migratory (BirdLife International, 2019). Herring gulls show high site fidelity to their breeding sites. Such high site fidelity may limit individual ability to adapt to changes and hence potential for population recovery from perturbations.

Herring gulls feeding in the marine environment are largely surface feeders, scavengers, and predators. Herring gulls are opportunistic foragers and will also forage in terrestrial environments. They have the ability to switch prey depending on what is available, meaning they may be more resilient to change if a particularly prey item decreases.

Annex 3: Glossary for Conservation Objectives and References

Glossary

Conservation Objective term	Definition
Distribution	The “distribution” is how the qualifying feature is spread out within the site.
Favourable condition	This refers to the assessed condition of a feature through Site Condition Monitoring. Features considered to be in favourable condition for the purposes of these Conservation Objectives are those that have an assessed condition of either: <ul style="list-style-type: none"> • Favourable Declining - The attribute targets set for the natural feature have been met, but evidence suggests that its condition will worsen unless remedial action is taken. • Favourable Maintained - the attribute targets set for the natural features have been met, and the natural feature is likely to be secure on the site under present conditions. • Favourable Recovered - the condition of the natural feature has recovered from a previous unfavourable condition, and attribute targets are now being met.
Generation length	Generation length is “the average age of parents of the current cohort”. Generation length therefore reflects the turnover rate of breeding individuals in a population (IUCN, 2019).
Maintain	Where a qualifying feature of the SPA is assessed as being in favourable condition the conservation objective is ‘maintain’. This means that the various attributes of the feature should be kept at that favourable level. This can include increasing/improving condition as well, but not a permanent decline.
Marine birds	This term encompasses true seabirds and waterfowl (seaducks, divers, and grebes).
Metapopulation	A group of connected populations of a species within a defined area, where the individual populations may interact with one another.
Restore	Where a qualifying feature of the SPA is assessed as being in unfavourable condition the conservation objective is ‘restore’. This means that the various attributes of the feature should be returned to the favourable level by increasing/improving condition.
Site integrity	The integrity of a site is defined in general terms as the coherence of its ecological structures and function, across its whole area, which enables it to sustain the habitat, complex of habitats and and/or the levels of populations of the species for which it was designated.
Site reference population	This refers to the estimated population figure for the site and should be used to form the basis of carrying out HRAs. In most cases, the site reference population will be the baseline population (figure at designation). However, where recent surveys show a population to have increased or stayed stable, the current population is considered the most appropriate population figure to use for HRA’s.

Conservation Objective term	Definition
Supporting habitats and processes	This includes the following environmental conditions (but is not limited to) which are important for maintaining/restoring the protected features, e.g. hydrography and supporting water currents, chemical water quality parameters, suspended sediment levels, radionuclide levels.
Unfavourable condition	This refers to the assessed condition of a feature through Site Condition Monitoring. Features considered to be in unfavourable condition for the purposes of these Conservation Objectives are those that have an assessed condition of either: <ul style="list-style-type: none"> • Unfavourable recovering - One or more of the attribute targets have not been met on the site, but management measures are in place to improve the condition. • Unfavourable no change - One or more of the attribute targets have not been met, and recovery is unlikely under the present management and activity on the site. • Unfavourable declining - One or more of the attribute targets have not been met, evidence suggests that condition will worsen unless remedial action is taken.
Waterfowl	Encompasses seaducks, grebes and divers.

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